FOOD MANUFACTURE

Incorporating Food Industries Weekly

A PUBLICATION OF THE LEONARD HILL TECHNICAL GROUP JUNE 1, 1958

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- ★ **enables equal parts of meat and fat to be used because it is non-glutinous**
- ★ **improves colour and flavour**
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Index to ADVERTISERS

	Page
Abbot & Co. (Newark) Ltd.	Feb.
Abix (Metal Industries) Ltd.	Dec.
Advita Ltd.	A87
Agricultural & Chemical Products, Ltd.	A101
Albro Fillers & Engg. Co. Ltd.	A78
Alfa-Laval Co., Ltd.	A5
Alite Machines, Ltd.	A88
Allen, Stafford, & Sons, Ltd.	A46
Allspeeds, Ltd.	A57
Anglo-American Plastics, Ltd.	April
Anhydro, A/S	May
Arenco, Ltd.	May
Asco Ltd.	Jan.
Associated Metal Works, Ltd.	A88
Associated Rousselot Traders, Ltd.	A58
Auto Wrappers (Sales) Ltd.	Feb.
Aylwin, Geo., & Son	May
Bacon, W. C., & Co., Ltd.	A88
Barron, W. S., & Son, Ltd.	A92
Bastian & Allen Ltd.	A90
Bear Honey Co., Ltd.	April
Beddington Nut & Produce Co., Ltd.	A101
Begg, Cousland & Co., Ltd.	A88
Bellingham & Stanley Ltd.	A98
Benjamin Electric, Ltd.	A39
Bennett, Sons & Shears, Ltd.	A76
Betts & Co., Ltd.	April
Bliss, E. W. (England), Ltd.	May
Boehm, Fredk., Ltd.	A41
Bollans, R. W. & Co., Ltd.	A94
Bonallack & Sons, Ltd.	A72
Boulton, William, Ltd.	May
Bragenmaskiner, AB	A102
Bramwell, S., & Co., Ltd.	A62
Brierley, Wm., Collier & Hartley, Ltd.	A66
British Arkady Co., Ltd.	May
British Belting & Asbestos, Ltd.	May
British Ceca Co., Ltd., The	May
British Celanese, Ltd.	Mar.
British Cellophane, Ltd.	A31
British Electrical Development Association	Dec.
British Hydrological Corporation	May
British Rayophane, Ltd.	A68
British Sidac Ltd.	A54
British Soya Products, Ltd.	A98
British Thomson-Houston Co. (Rugby)	May
Broadbent, Thomas, & Sons, Ltd.	May
Brotherton & Co., Ltd.	A37
Brown & Forth, Ltd.	May
Brown, N. C., Ltd.	A90
Brown & Polson, Ltd.	Cover I, A11
Bruckner Werke	Feb.
Bryan, Wm., Ltd.	A70
Bush, W. J., & Co., Ltd.	A23, A92
Butterfield, W. P., Ltd.	A18
Butterley Co., Ltd.	A47
BX Plastics, Ltd.	Dec.
Cabaret, Le, G. H. Rabu	A101
Caleb Duckworth, Ltd.	A90
Calfos, Ltd.	May
Cambridge Instrument Co., Ltd.	April
Canning Town Glass Works, Ltd.	A90
Cashmore, John, Ltd.	April
Caxton Chocolate Co., Ltd.	A21
Clarke-Built, Ltd.	A63
Clark, George & Co., Ltd.	Cover I
Clark, T. & C., Ltd.	Feb.
Cleveland Meters Ltd.	Feb.
Coates, Bros. Inks, Ltd.	Mar.
Cohen, George, Sons & Co., Ltd.	May
Colt Ventilation, Ltd.	May
Commer Cars, Ltd.	April
Confectioners' Vegetable Colours & Fruit Essences Co., Ltd.	Dec.
Cooper, McDougall & Robertson, Ltd.	A40
Couper Friend & Co., Ltd.	May
C.P. Equipment, Ltd.	A64
Cradley Boiler Co., Ltd.	A94
Craigmillar & British Creameries, Ltd.	A19
Crampton, John, & Co., Ltd.	Jan.
Crofts (Engineers), Ltd.	A50, A51
Crompton Parkinson, Ltd.	May
Crookes Laboratories, Ltd.	May
Dale, John, Ltd.	Jan.
Dallow Lambert & Co., Ltd.	A27
Dalmas, Ltd.	April
Daniels, S., & Co., Ltd.	A101
Danks, Edwin & Co., Ltd.	A77
Davey, Paxman, & Co., Ltd.	May
Dawson Bros., Ltd.	May
Dodge Bros. (Britain) Ltd.	April
Dodman, Alfred, & Co., Ltd.	A74
Douglas, Charles E., & Co., Ltd.	May
Drakesons	A101
Drayton Regulator & Instrument Co.	A49
Duche, T. M., & Sons, Ltd.	A68
Electropower Gears, Ltd.	A96
Elliott Bros. (London), Ltd.	May
Enamelled Metal Products Corpn. (1933), Ltd.	May
Evans, Norman, & Rais, Ltd.	May
Evans, Wm., Co., Ltd.	A55
Evershed & Vignoles, Ltd.	Feb.
Evode, Ltd.	A17
Fabbrica Macchine Industriali	A14
Factory Equipment Exhibition	April
Felber Jucker & Co., Ltd.	April
Fenner, J. H., & Co., Ltd.	A71
Fisher's Foils, Ltd.	May
Fisons Milk Products, Ltd.	Dec.
Flexibox, Ltd.	May
Flexile Metal Co., Ltd.	April
Florasynth Laboratories (England), Ltd.	Jan.
Follsain-Wycliffe Foundries, Ltd.	May
Foodtech, Ltd.	A3
Ford Motor Co., Ltd.	A16
Foster Instrument Co., Ltd.	April
Fraser, J., & Son, Ltd.	May
Fraser, W. J., & Co., Ltd.	April
Frigidaire Division of General Motors Ltd.	A28
Fuller Horsey, Sons & Cassell	A102
Galco (London), Ltd.	Feb.
Garvin, L., & Co., Ltd.	April
Gas Council	Cover 4
General Electric Co., Ltd.	May
Golden Glow, Ltd.	A79
Gosheron, John & Co., Ltd.	April
Graviner Mnfg. Co., Ltd.	May
Greening, N., & Sons, Ltd.	May
Gunson, R. W. (Seeds), Ltd.	May
G.W.B. Furnaces, Ltd.	A30
Haas Vakuum-Technik G.m.b.H.	A94
Hanover Fair	Mar.
Hart, W. J., Ltd.	May
Harvey, G. A. & Co. (London), Ltd.	A93
Heston Equipment Co., Ltd.	Cover 3
Hiller, Parker, May & Rowden	Jan.
Hodgkinson, James (Salford), Ltd.	A64
Hodgson, Richard & Co., Ltd.	A78
Holdan Engineers (London), Ltd.	May
Holmes, W. C. & Co., Ltd.	May
Honeywell Brown, Ltd.	May
Hopkinsons, Ltd.	May
Howard Pneumatic Engg. Co., Ltd.	A10
Howard (Westminster) Engg. Co.	May
Howorth, James, Ltd.	Jan.
Hunt, John (Bolton), Ltd.	A6

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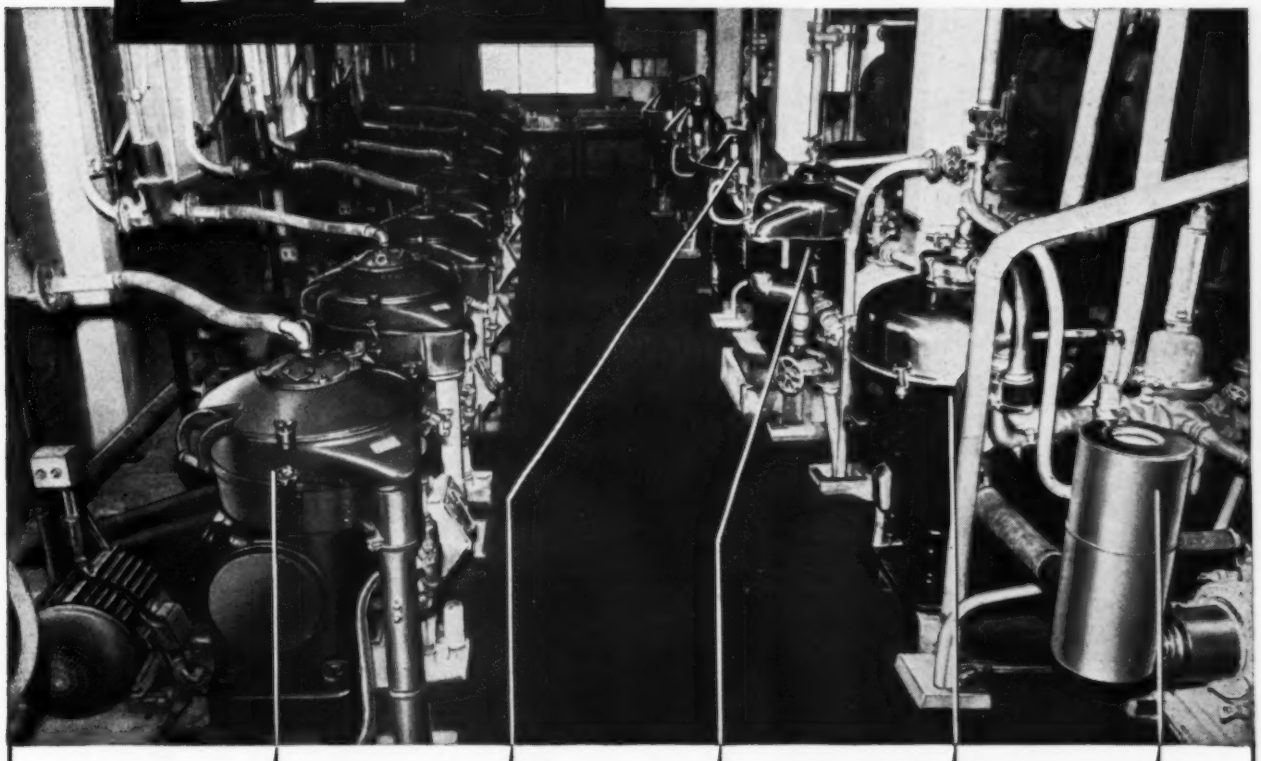

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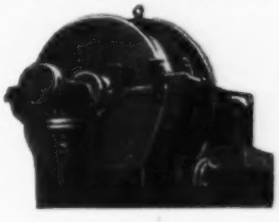

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Index to ADVERTISERS

	Page
Hunter, G. (London), Ltd.	A94
Huntley Boorne & Stevens, Ltd.	Mar.
Huxtable, W. G. (Swansea), Ltd.	Jan.
Imperial Chemical Industries, Ltd.	A26, A53, A67
Incinerator Co., Ltd.	May
Jackson, J. G., & Crockatt, Ltd.	Jan.
Jenkins, Robert, & Co., Ltd.	Mar.
Jenner, A. & C. Co., Ltd.	A7
Johnson, A., & Co. (London), Ltd.	A83
Johnson, C. H. (Machinery), Ltd.	A62
Kappa Moisture Meters, Ltd.	A58
Karrier Motors, Ltd.	A65
Kellie, R. & Son, Ltd.	A69
Kendall, F., & Son, Ltd.	A102
Kestner Evaporator & Engg. Co., Ltd.	May
Key Glassworks, Ltd.	May
Kingston upon Hull Development Committee	May
Klaxon	A82
Kork-n-Seal, Ltd.	A22
Lambert, L., & Co., Ltd.	May
Lawtons of Liverpool, Ltd.	A92
L.C.C.	A97
Leverton Myers	A13
Lidano A/S	May
Light Alloy Construction, Ltd.	A95
Loders & Nucoline, Ltd.	A86
Maitlands (Metal Works), Ltd.	May
Mancuna Engg. Co., Ltd.	May
Marshall Hardy, Ltd.	Jan.
Mason & Morton	May
Mather & Platt, Ltd.	A84
May & Baker, Ltd.	May
Measurement, Ltd.	A80, A81
Mechanical Handling Exhibition	April
Metaducts, Ltd.	April
Metal Box Co., Ltd.	April
Metal Closures, Ltd.	May
Metal Propellers, Ltd.	May
Meynell & Sons, Ltd.	A92
Milk Products (N.Z.), Ltd.	May
Mitchell, L. A., Ltd.	A66
Mono Pumps, Ltd.	May
Monsanto Chemicals, Ltd.	May
Mountain, A. & F., Ltd.	Jan.
Munton & Fison, Ltd.	A24
National Glass Works (York), Ltd.	A35
Negretti & Zambra, Ltd.	May
Newman, William, & Sons, Ltd.	A12
Nipa Laboratories, Ltd.	May
Nordischer Maschinenbau Rud. Baader	Jan.
Norman Engg. Co.	A70
Oppenheimer Casing Co. (U.K.)	A59
Ormerod Engineers, Ltd.	May
Packaging Machinery (Peters), Ltd.	A48
Padley & Venables, Ltd.	A8
Parsons, S., & Co., Ltd.	A91
Paterson Hughes Engg. Co., Ltd.	May
Permoglaze, Ltd.	May
Permutit Co., Ltd.	A25
Peters, G. D., Ltd.	A48
Peters, Robert (Nottm.), Ltd.	May
Plenty & Son, Ltd.	A85
Polak & Schwarz (Eng.), Ltd.	Cover 2
Porteus, G., & Sons, Ltd.	A74
Premier Colloid Mills, Ltd.	A34
Premier Filterpress Co., Ltd.	A98
Pulsometer Engg. Co., Ltd.	A102
Pulversing Machinery, Ltd.	A36
Purdy Machinery Co., Ltd.	A89
Q.V.F., Ltd.	May
Rayner & Co., Ltd.	May
Reads, Ltd.	Mar.
Realm Engg. Works, Ltd.	May
Reed Corrugated Cases, Ltd.	A32
Renold Chains, Ltd.	A89
Rhoden Partners, Ltd.	Jan.
Roche Products, Ltd.	A9
Rose, Downs & Thompson, Ltd.	May
Sainsbury, J., Ltd.	Mar.
Samuelson, P., & Co.	May
Sanders, H. G., & Son, Ltd.	May
Saunders Valve Co., Ltd.	May
Sauven Perforating Machine Co., Ltd.	A96
Scan, Ltd.	May
Scherer, R. P., Ltd.	May
Schimmel Boehm, Ltd.	A38
Scott-Rietz, Ltd.	May
Sellotape	A15
Semtex, Ltd.	May
Sharples Centrifuges, Ltd.	May
Simon, Henry, Ltd.	A76
Skerman, C., & Co., Ltd.	A100
SMALL ADVERTISEMENTS	A99-A101
Smith & McLaurin, Ltd.	May
Smiths Insulations, Ltd.	A20
Spencer-Bonecourt-Clarkson, Ltd.	A82
Spesco Developments, Ltd.	May
Stabilag Co., Ltd.	A102
Stainless Steel Vessels (London), Ltd.	A42
Steel Co. of Wales, Ltd., The	A60, A61
Stelcon (Industrial Floors), Ltd.	A44
Stevenson & Howell, Ltd.	May
Stokes & Dalton, Ltd.	A52
Sturge, J. & E., Ltd.	A73
Taylor Rustless Fittings Co., Ltd.	May
Technoexport	May
Telegraph Construction & Maintenance Co., Ltd.	Dec.
Thames Board Mills, Ltd.	May
Thomas, Richard, & Baldwins, Ltd.	Feb.
Trapow, D., & Co., Ltd.	Mar.
Tweedy, G., & Co., Ltd.	A95
Ultrasonics, Ltd.	May
Union Food Machinery and Equipment, Ltd.	April
United Glass Bottle Manfrs., Ltd.	A45
Universal Exhibitions	May
Universal Metal Products, Ltd.	May
U.S. Autowash, Ltd.	A93
Valrecchio, s.p.a.	A98
Varley, F.M.C., Ltd.	May
Venesta, Ltd.	A43
Visco Engg. Co. Ltd.	A4
Viscose Development Co. Ltd.	A56
Viskase, Ltd.	May
WAECO, Ltd. (Fumite Division)	Dec.
Walker, Crosweller & Co., Ltd.	May
Warwick Production Co., Ltd.	A29
Webster, Isaac, & Sons, Ltd.	May
Weir, G. & J., Ltd.	Dec.
Welch, J. A., Ltd.	May
West Country Converters, Ltd.	April
Wetter, J. C. & Co., Ltd.	A91
Whittaker, Arthur	A101
Wiggins Teape Co., Ltd.	May
Willcox, W. H., & Co., Ltd.	A33
Williams (Hounslow), Ltd.	Mar.
Wilts United Dairies, Ltd.	May
Wood, Rozelaar, & Wilkes, Ltd.	Jan.
York Shipley, Ltd.	A75
Youngman, W. C., Ltd.	A96

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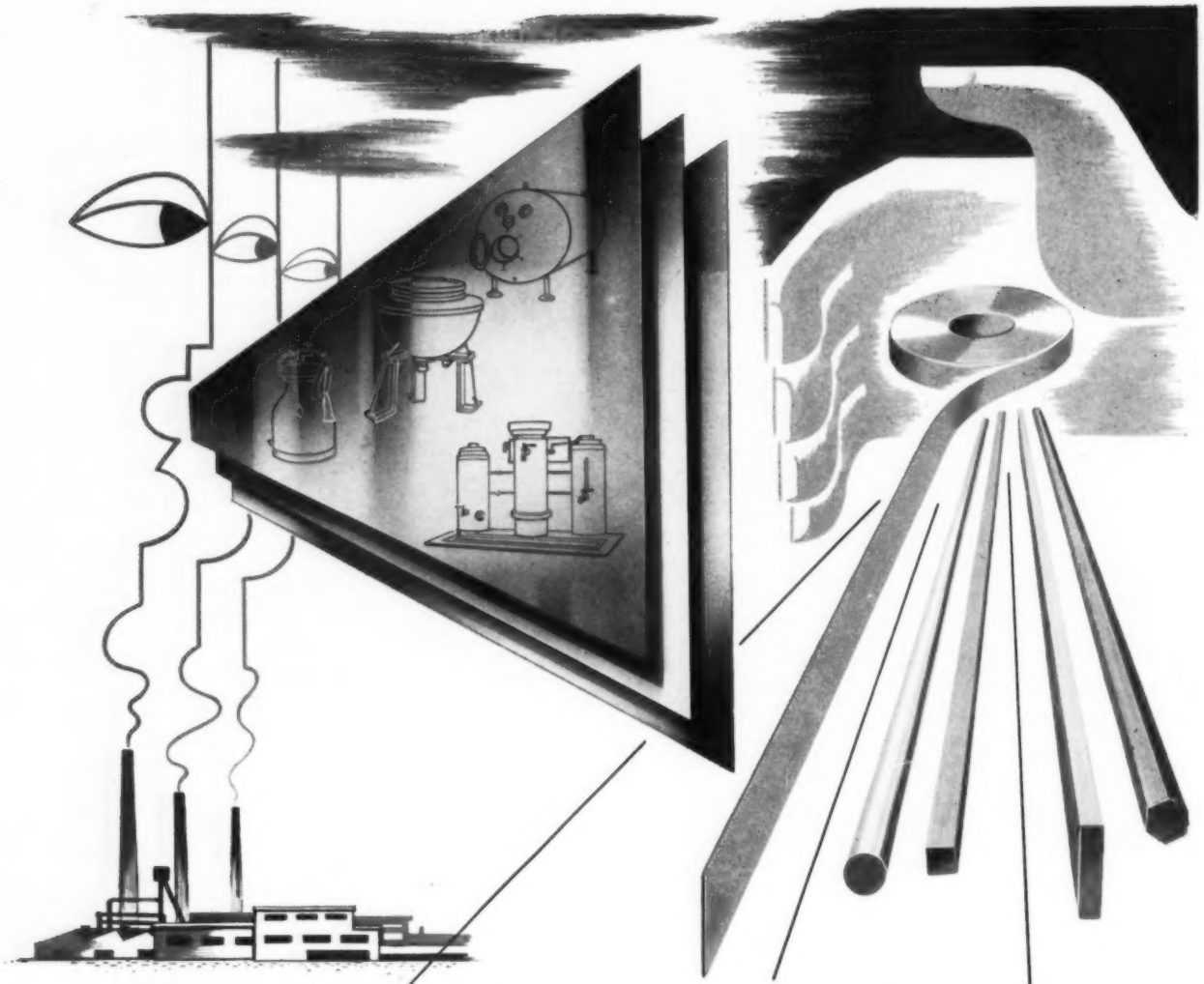

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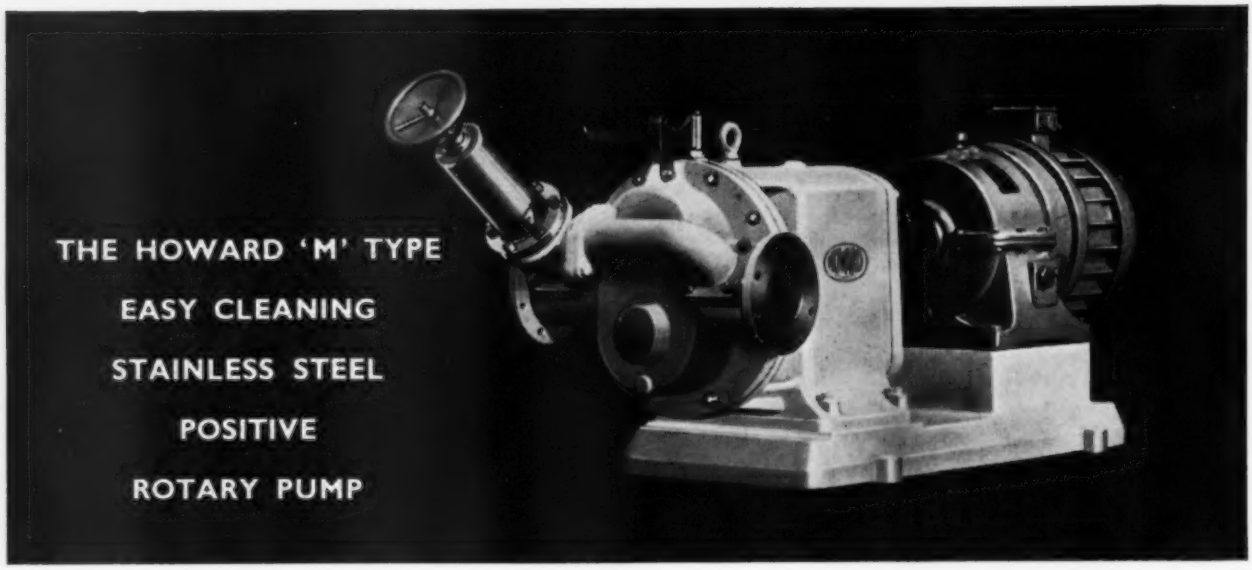

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★ No contact of moving parts in the pump chamber.

★ Large suction and discharge passages and easy streamlined flow through the pump enable it to handle thick and viscous liquids with ease.

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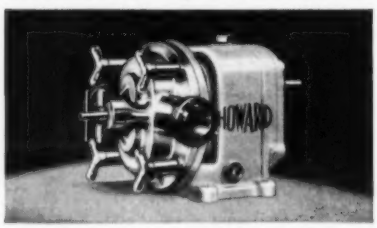
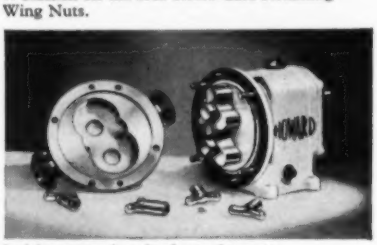
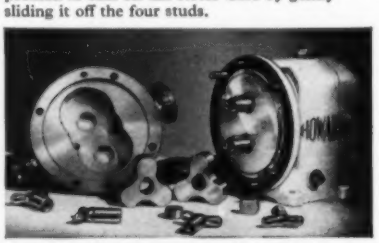


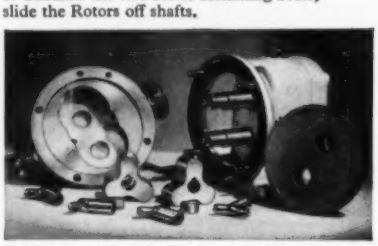
1. Slacken off the four Rotor Case Retaining Wing Nuts.



2. After removing the four wing nuts, proceed to take off the Rotor Case by gently sliding it off the four studs.



3. Unscrew the two Rotor Retaining Nuts, slide the Rotors off shafts.



4. After removing the Rotors, pull the backplate forward over the two shafts; all components may then be cleansed with boiling water, or detergent.

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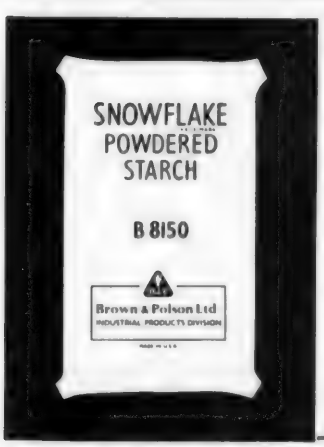

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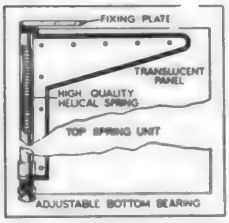
What is a door?

The dictionary defines a door as "a barrier at the entrance to a room or building". Every building has a door, and each door has its problems. In factories, hospitals, warehouses and offices, in fact wherever there are doorways constantly used by traffic, there is need for a door that will eliminate accidents and withstand damage. Neway Translucent Doors do just this. The doors are fitted with plastic panels which allow objects on the other side to be seen in shaded form whilst still retaining privacy. The panels are flexible and yet close tight enough to seal out draughts and noise. Smart, easily cleaned, and self-closing, they absorb shock and blows from passing traffic without damage either to the traffic or to themselves. Neway Translucent Doors are available in sizes up to 8′ × 6′ per pair, and can be installed in existing frames. Once fitted little or no maintenance is ever needed.



The framework of the door consists of a vertical tube which fits close to the door frame. Concealed in the top of the tube is the patented double action return spring—this is fully adjustable and ensures that the door is self closing. The door pivots at the top and bottom on axles let into the lintel and into the floor.

NEWAY

Translucent Doors

✻ *Write now for free leaflet giving full information about Neway Translucent and Rubber Doors*

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gives all over gloss finish for even

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They will tell you that these advantages put the

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● THE BEST EVER DIESEL OR PETROL OPTION is now yours with the new Thames Traders:—

4-Cylinder Diesel Engine OR **4-Cylinder Petrol Engine**	*for 30 cwt. 2, 3, 4 and 5 ton trucks*
***NEW* 6-Cylinder Diesel Engine** OR ***NEW* 6-Cylinder Petrol Engine**	*for 4, 5 and 7 ton trucks 4½, 5 and 6 cu. yd. Tippers*

● PLUS an extensive range of optional factory-fitted equipment . . .

and FORD SERVICE, too!

SEE YOUR DEALER FOR FULL DETAILS AND PRICES

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H-W.82

Left: An aluminium Storage Vessel

Butterfield craftsmen are called upon to turn out a wide variety of Stainless Steel, Mild Steel, and Nickel plant, Tanks, Vats, Vessels and so forth, to Plant Engineers' specifications for the storing, processing and refining of liquids for the Food Industry. This is important work for important jobs and Butterfield expert craftsmanship and attention to detail can be relied upon to produce extremely good results.

May we quote for your next job?

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Storage & Processing Equipment

fabricated by experts in

STAINLESS STEEL
MILD STEEL
(*Jacketed*)

ALUMINIUM
AND NICKEL

Above: A row of Stainless Steel pans for a series of tilting pans

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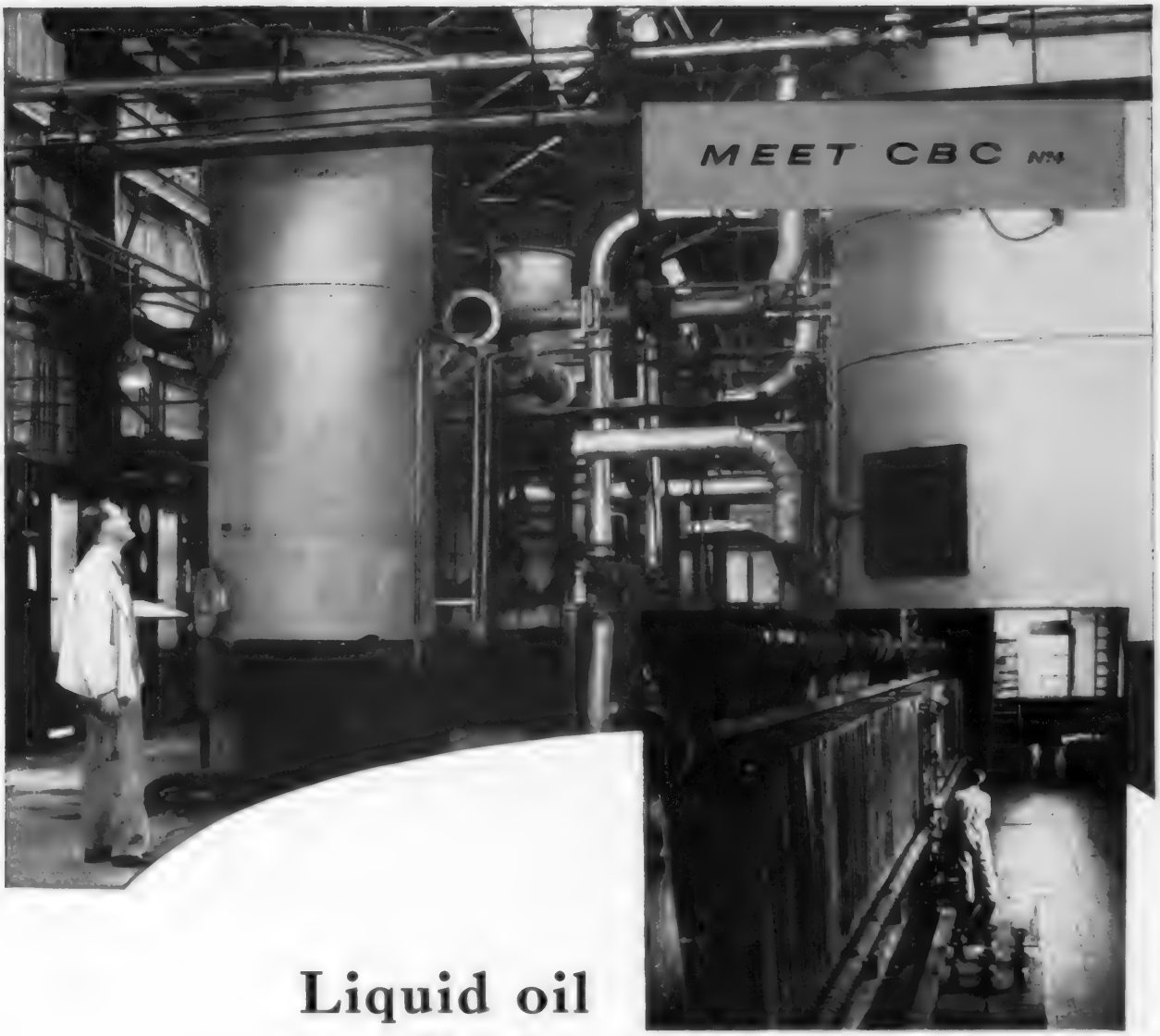

The "Blue Gas" method (above) and the Electrolytic cell (inset) combine to produce over 4 million cubic feet of hydrogen weekly at CBC's Bromborough factory.

Liquid oil to solid fat

Some vegetable oils—coconut, for instance—are solid fats even at normal temperature. But many are normally liquid, and before they are blended together, they have to be treated in a special way. A process involving hydrogen is used to change these oils into solid fat. This process of "hydrogenation" not only hardens but also gives the fat it produces a far greater resistance to spoilage in general and rancidity in particular. Here, as at every stage of manufacture, it is the concern of CBC to ensure that only pure, wholesome fats are used in any of their products.

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whatever you produce . . .

cakes, cake mix, ice cream, biscuits or pastry of any kind, one or more of these CBC quality fats will meet your need:—

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NEW DEPOTS by

SULATIONS LTD.

The photograph at right shows a section of a new fish store recently completed for Messrs. Marr & Sons, of Hull. It has a capacity of 200,000 cubic feet, with labour-saving palletisation, giving low running costs.

RAPID PROGRESS OF LARGE SCALE PROJECTS

Enormous developments in cold storage are now taking place. Smiths Insulations Ltd. are using new techniques to build some of the largest and most efficient cold stores in the world, much more quickly than was hitherto possible. Photographs on left show progress on (1) a sub-zero store of one million cu. ft. capacity; (2) a simultaneous contract for a 600,000 cu. ft. low temperature store. Other contracts proceed at the same time for large fish, food, ice-cream, and beer stores. Our 84 years experience and resources enable us to offer a complete service in the design and construction of cold stores of any size. By our methods of prefabrication, building time and costs are greatly reduced, and completion speeded up.

WATCH FOR FURTHER ANNOUNCEMENTS OF THESE VAST DEVELOPMENTS AND FOR WHOM THEY ARE BEING UNDERTAKEN.

INSULATIONS LTD.

AND NOW *Caxton on tap!*

We don't merely advocate progress—we promote it! Here as proof is our new road tanker, designed specifically to pipe liquid chocolate straight into your plant. The labour-saving advantages are obvious. The carrying and breaking of blocks, and the melting procedure are eliminated. Staff at present employed in these departments can be usefully transferred elsewhere . . . space saved can be used to provide increased production facilities In short, a continuous line flow process is a "must" for every manufacturer who believes in automation and parallel developments.

Our Technical Advisory Service will be pleased to assist you with plans, advice and demonstrations so that you may profit from the advantages of liquid bulk delivery at the earliest possible opportunity. Why not get in touch with us, immediately?

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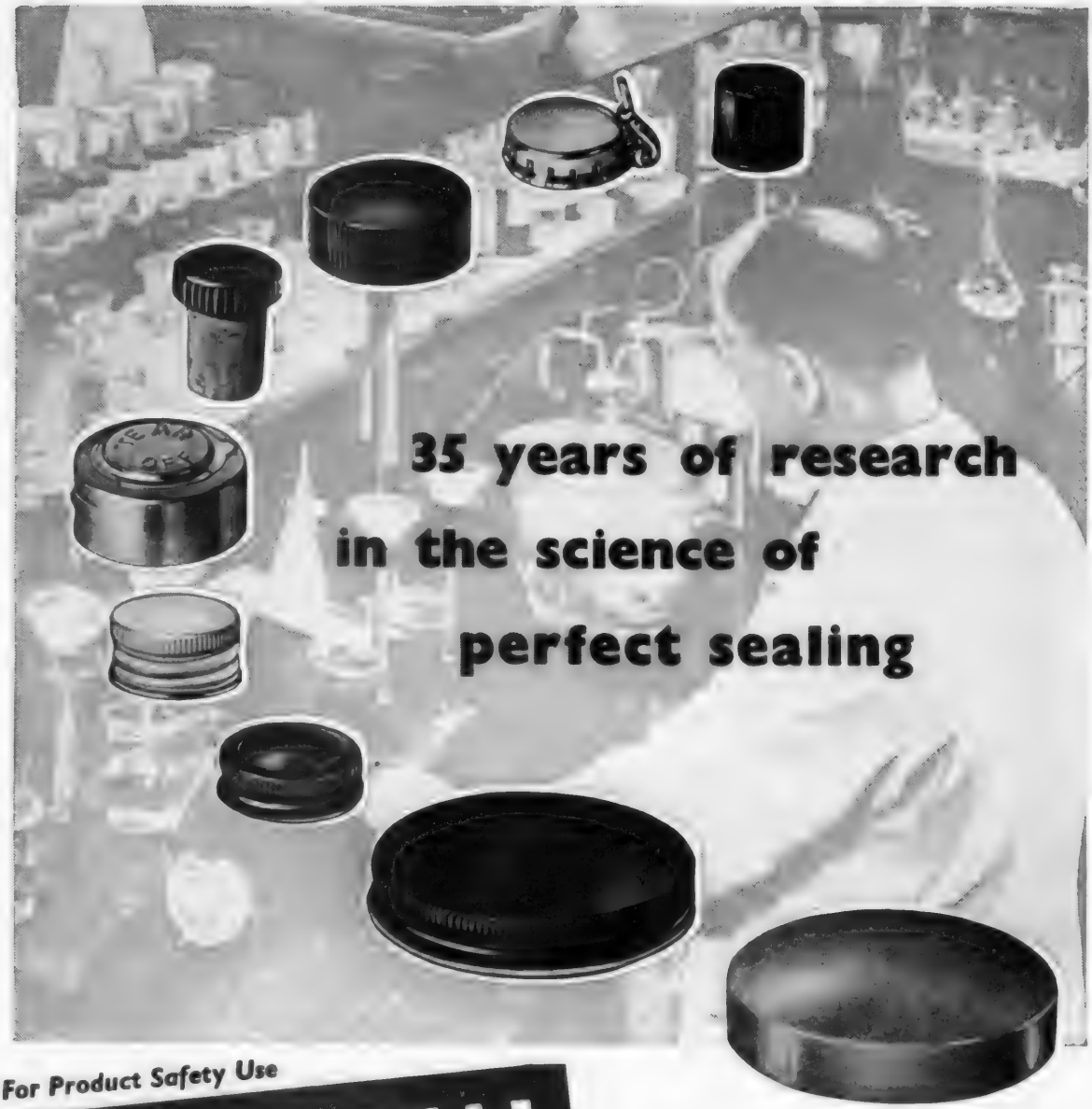

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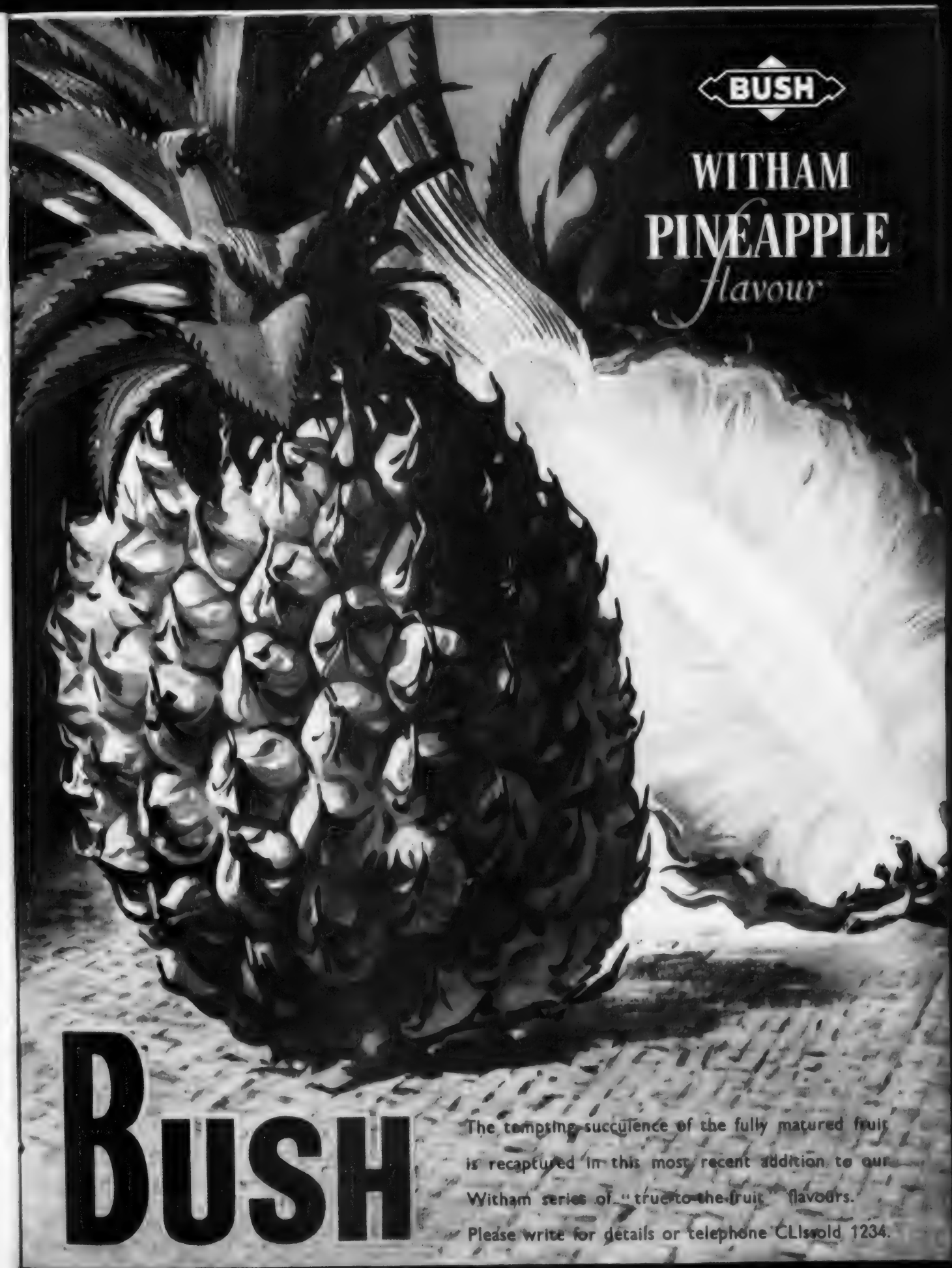

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The tempting succulence of the fully matured fruit is recaptured in this most recent addition to our Witham series of "true-to-the-fruit" flavours.

Please write for details or telephone CLIsgold 1234.

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6 GALLONS AN HOUR!

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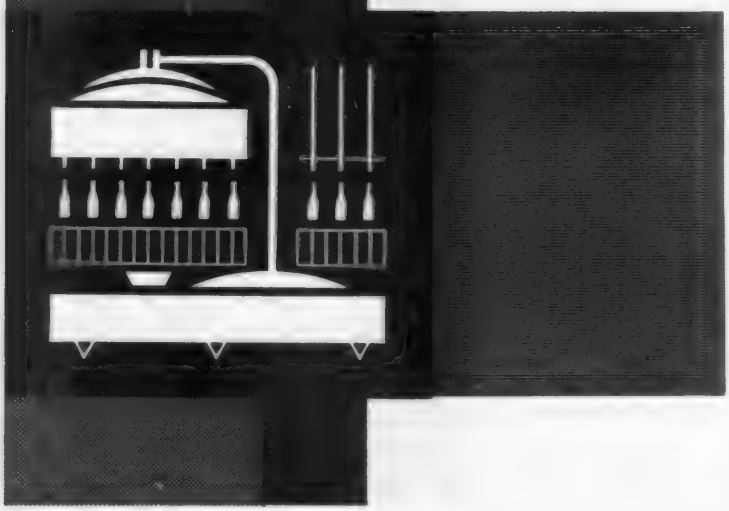

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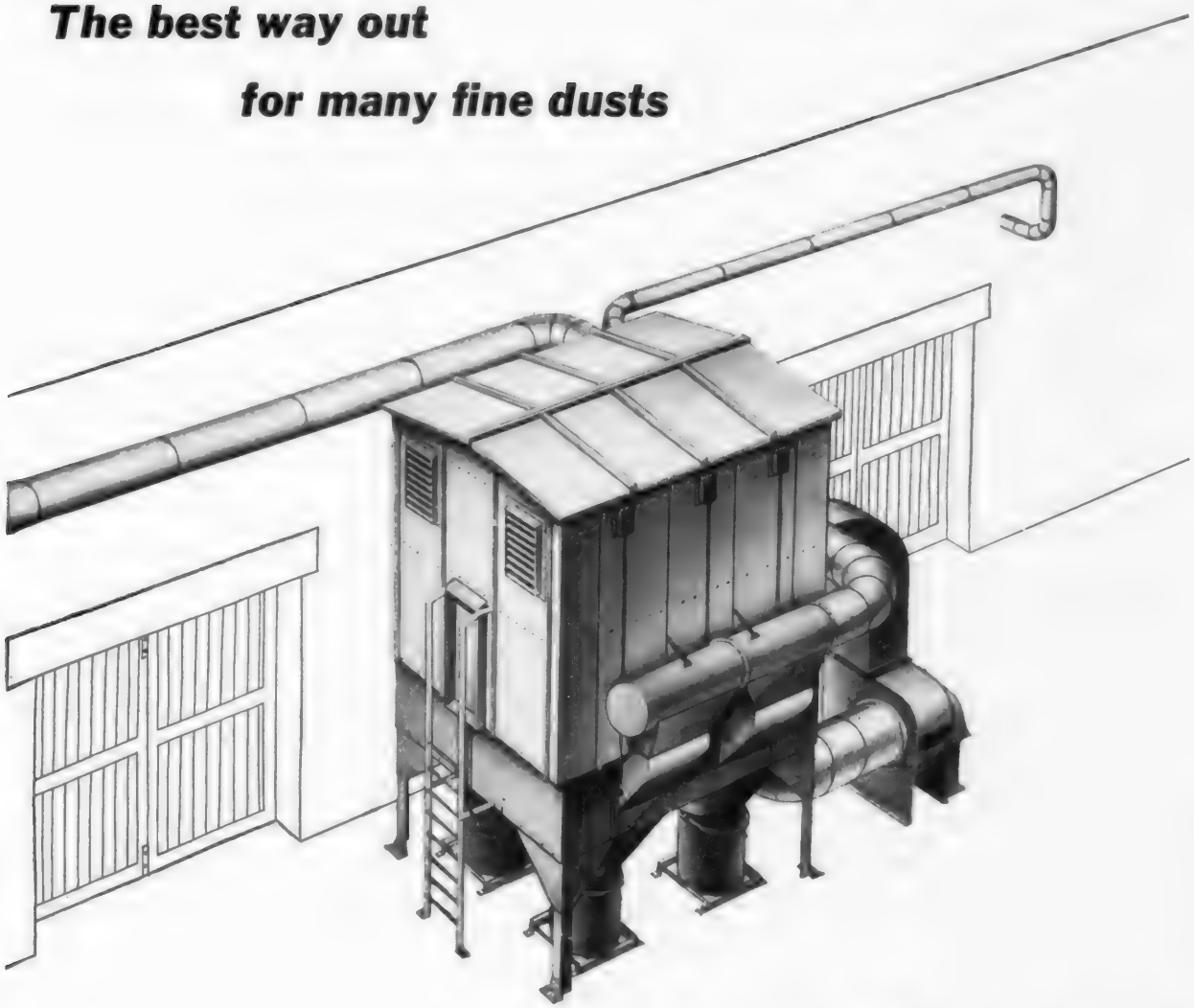
The best way out for many fine dusts



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DUST CONTROL EQUIPMENT FOR INDUSTRY

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DALLOW LAMBERT & COMPANY LIMITED, THURMASTON, LEICESTER

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Top quality...

First-class service...

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Call Frigidaire or your local Frigidaire Distributor *now*, for full information and advice on Frigidaire's *complete* range of equipment for the Frozen Food industry.

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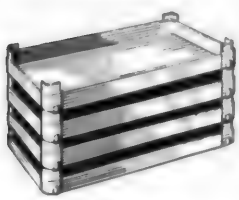
HYGIENE puts YOU on OUR metal!

ALUMINIUM

STACKING BOWLS



An extremely robust container of 16″ diameter × 8½″ or 12″ or 15½″ deep—5, 7½ or 10 gallons capacity respectively. Manufactured from 10 gauge aluminium with drop down, or fixed, side handles and stacking feature. Used in a wide variety of trades for the conveying or storage of all kinds of wet or dry foods. All sizes interstack and lids can also be provided.

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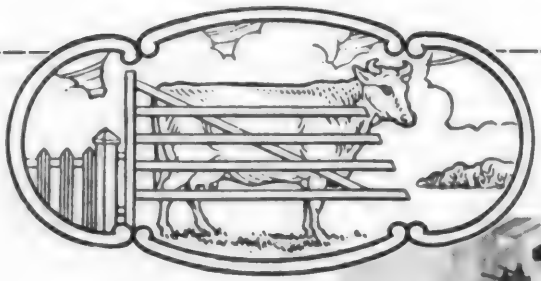
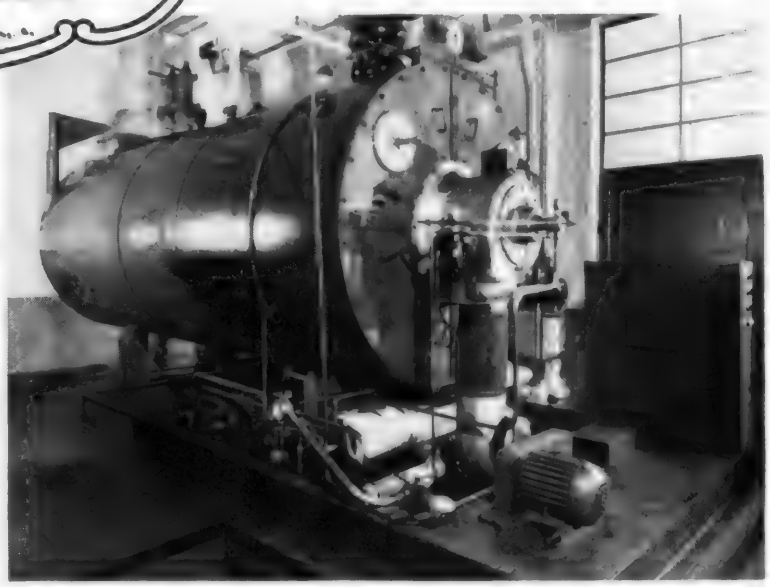
Powermaster at work

Case History No. 3

COW & GATE LTD.





Successful operation of one Powermaster Packaged Oil-Fired Boiler leads to further orders by the Cow & Gate Group

Dried Milk Products Ltd., the subsidiary of Cow & Gate, Ltd., which operates the Lostwithiel Factory, is inter alia, a large manufacturer of various types of dried milk. A Model 200 Powermaster was installed primarily for the production of process steam, while a certain proportion is used for heating purposes. The Model 200 has a maximum steam output of 6,900 lbs. of steam per hour F & A 212°F. The success of this first Powermaster, installed over a year ago, has led to orders for further units which will be delivered shortly.

Powermaster Boilers have proved a money saving investment for every kind of business and industry. Write for the Powermaster Bulletin.

"STEAM COSTS GO DOWN WHERE POWERMASTER GOES IN"

GWB

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PROPRIETORS: GIBBONS BROS LTD AND WILD-BARFIELD ELECTRIC FURNACES LTD

GWB 116

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Take the case of one large-scale pie manufacturer. When this company introduced a new line, they wanted every pie to be hygienically protected and factory-fresh right to the table. But they also wanted the pies to be *seen* in the shops, to sell themselves. They knew the golden-brown crust would whet the customer's appetite and make her buy. In short, they wanted full protection *and* visibility.

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Packaged in the right type of "Cellophane" the new pies were an instant success. They sold fast in conventional shops, were ideal for self-service. The transparent "Cellophane" wrap was a guarantee to the housewife of quality and cleanliness. Today, "Cellophane" is developing new markets for these pies all over the country.

The Right Film for the Job

"Cellophane" is made in a wide variety of types and gauges to meet the needs of every sort of product. Ideal for food products that need exceptional moisture protection is MXXT "Cellophane". The most moistureproof film in the world, MXXT "Cellophane" is now being used to package an increasing number of food products with outstanding success. For expert advice on the right film for *your* packaging job, why not drop us a line?

FOR PUTTING OVER your name and brand, there's nothing to beat colour-printed "Cellophane". We can put you in touch with the best film-printers and bag-makers — such as our associated company, Colodense Limited.

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"Cellophane" is the registered trade mark of British Cellophane Limited and denotes the brand of cellulose film manufactured by them

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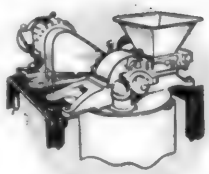
PULVERIZING
AIR CONVEYING
DUST COLLECTION

EQUIPMENT for grinding and blending to fine quality powders and dusts

Mikro-D equipment has been built for many years in Bristol by George Adlam & Sons Ltd., in association with Pulverizing Machinery Division Metals Disintegrating Co. Inc., of U.S.A. This is now marketed solely by Pulverizing Machinery Ltd., a new company representing these parent organisations, who are able to offer Mikro-D users an efficient spares service, and the facilities of extensive research laboratories at Bristol.



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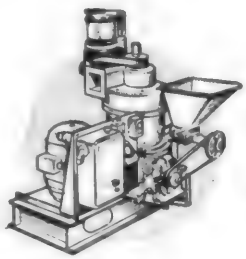
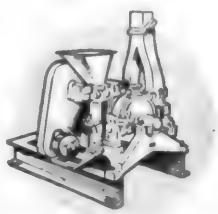


The Mikro-Bud
A new vertical hammer mill with built-in air classifier for the reduction of solids to within the 80-10 micron range. Particle sizing can be changed in seconds while the machine is in operation.
10°F maximum temperature rise.
Available in two sizes giving 35/70 lbs. per hp/hour.



The Mikro-Atomizer
A mechanical, screenless mill for the production of smooth, ultra-fine powders in the lower micron range (25-1 microns). Compact and highly efficient. Available in three sizes with capacities from 5-5,000 lbs. per hour.

PULVERIZING MACHINERY LIMITED

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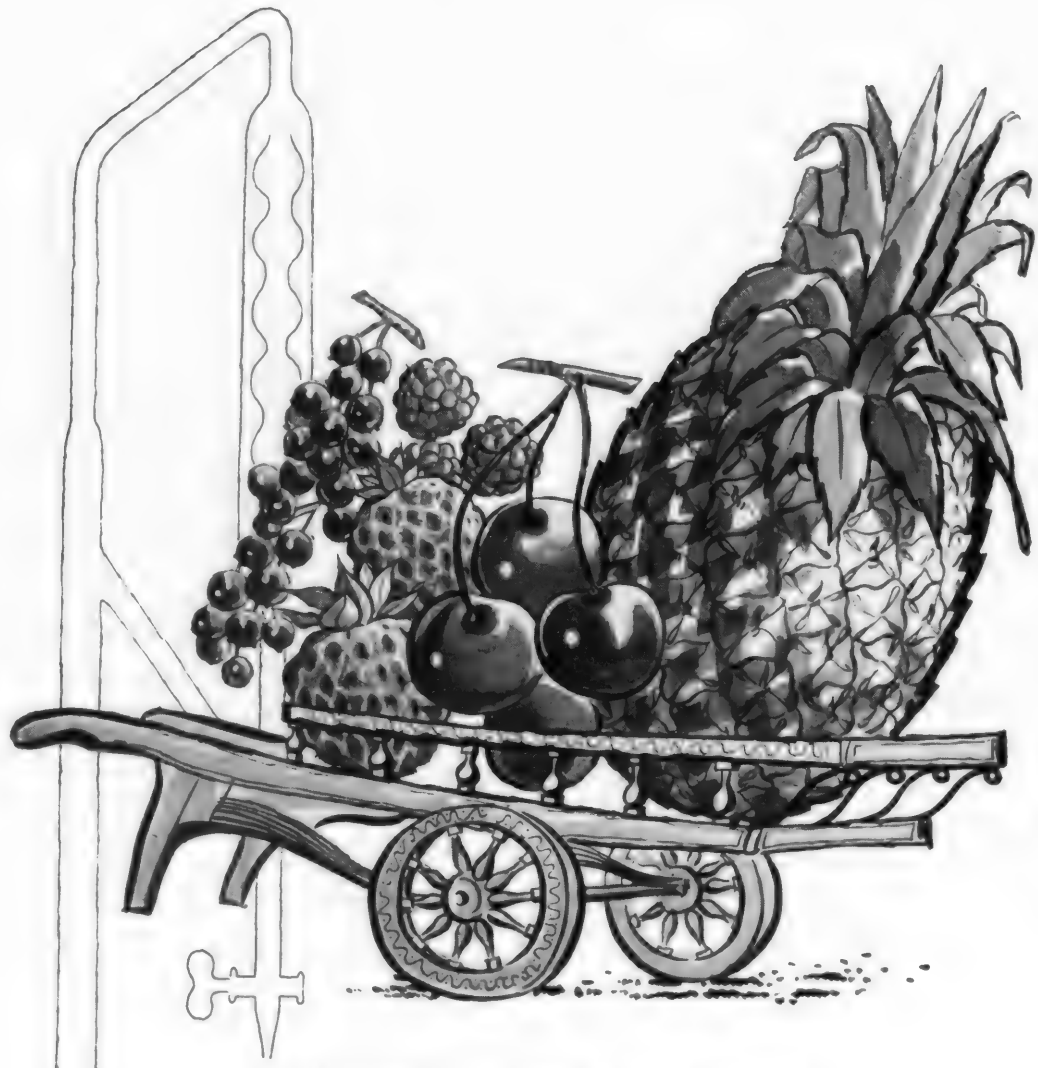

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Bulk to 6,868mls. with water
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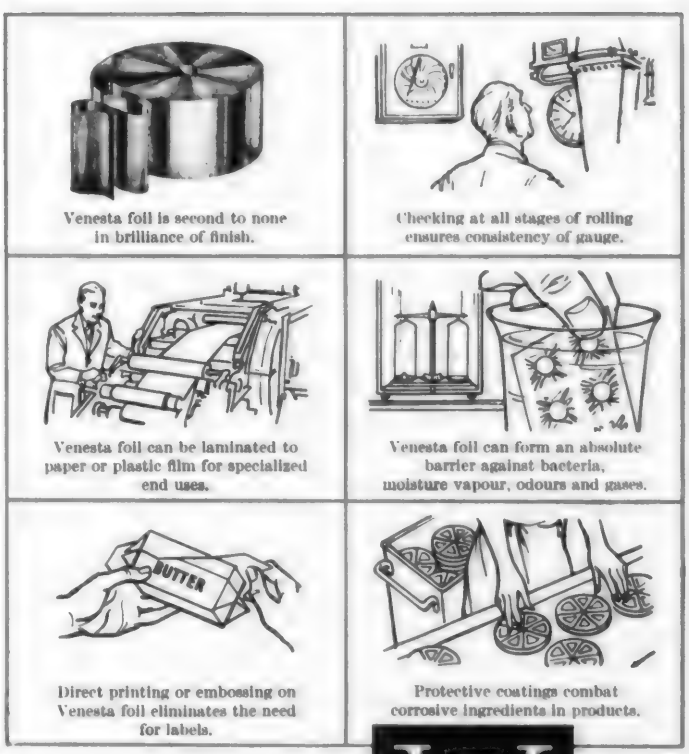

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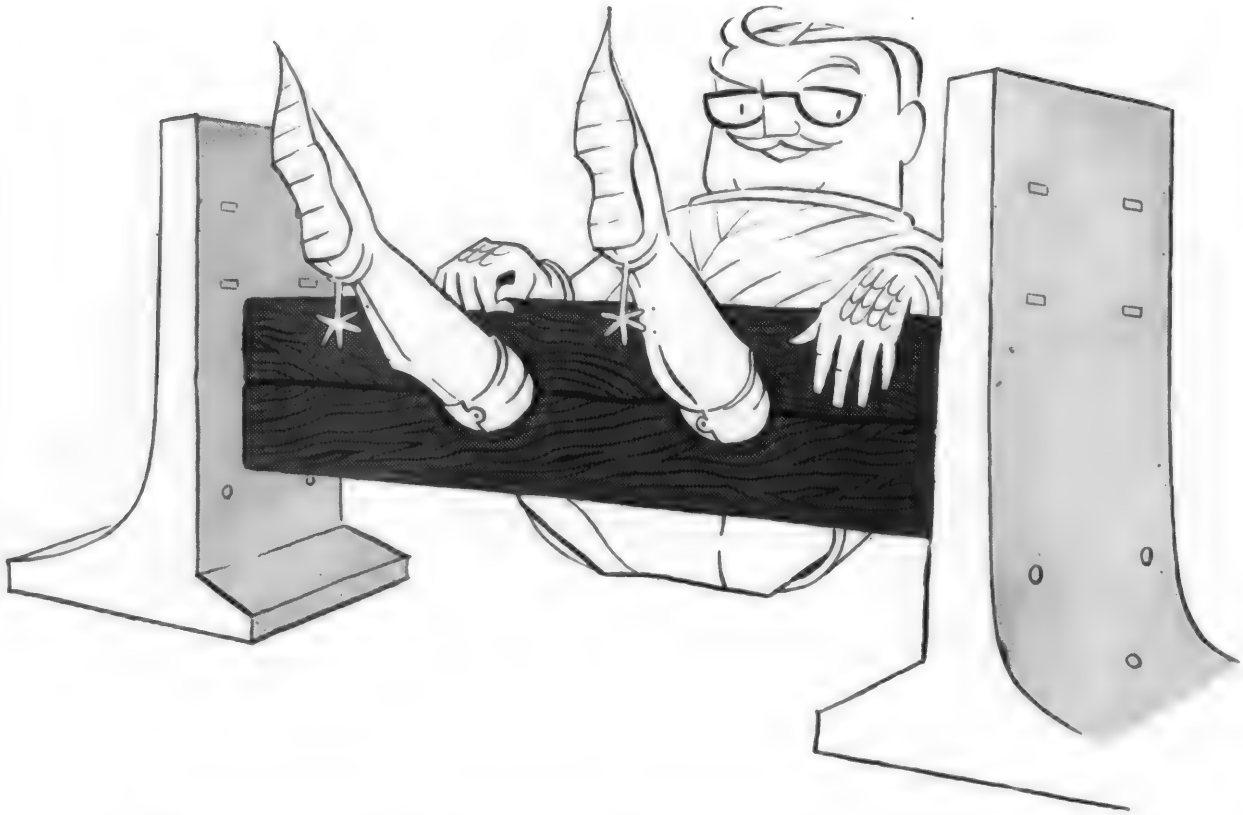

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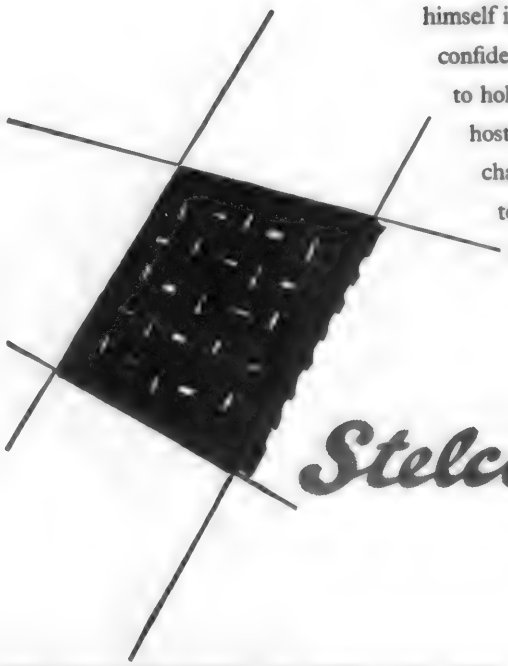
Our Sales Director is quite willing to make a laughing stock of himself in the cause of Stelcon. So here he rests awhile, confident in the ability of Anchor Steel Plates to hold the floor year in, year out, no matter how hostile the traffic. Indeed, the Saucy Knave challenges you to throw anything you like at them as a test ("Not that tomato, sir, if you please . . . the pips get in my joints, so!")

Stocks by courtesy of Stelcon's famous Storage Walls.



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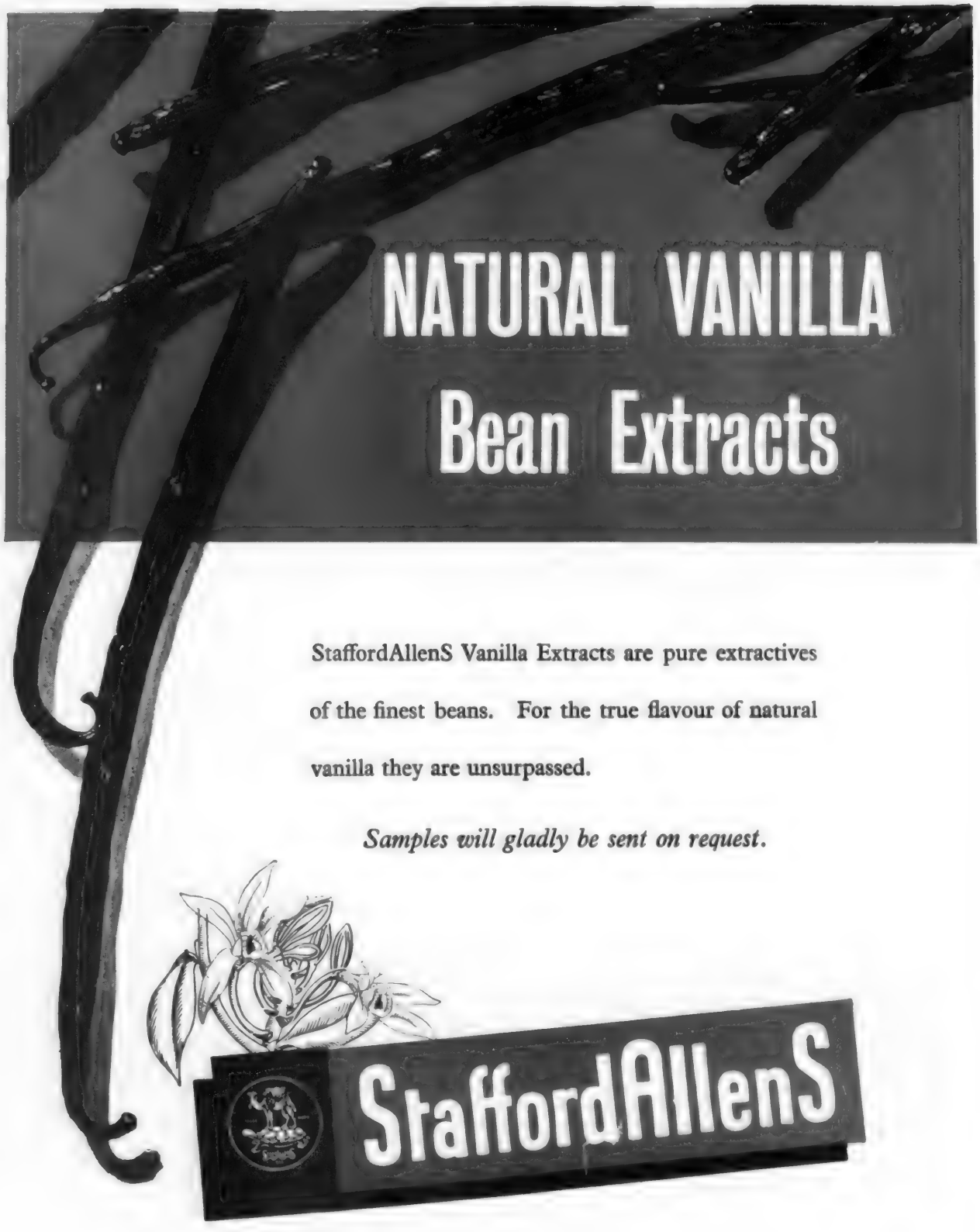
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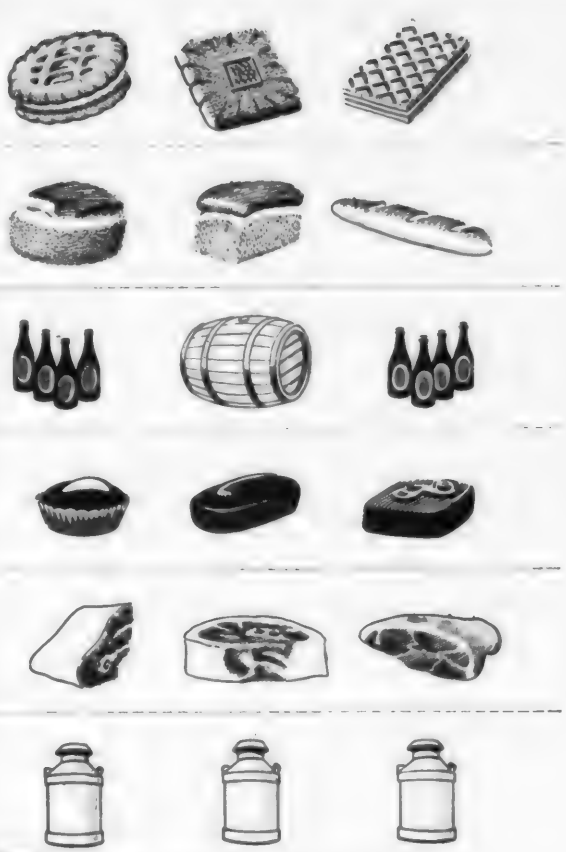

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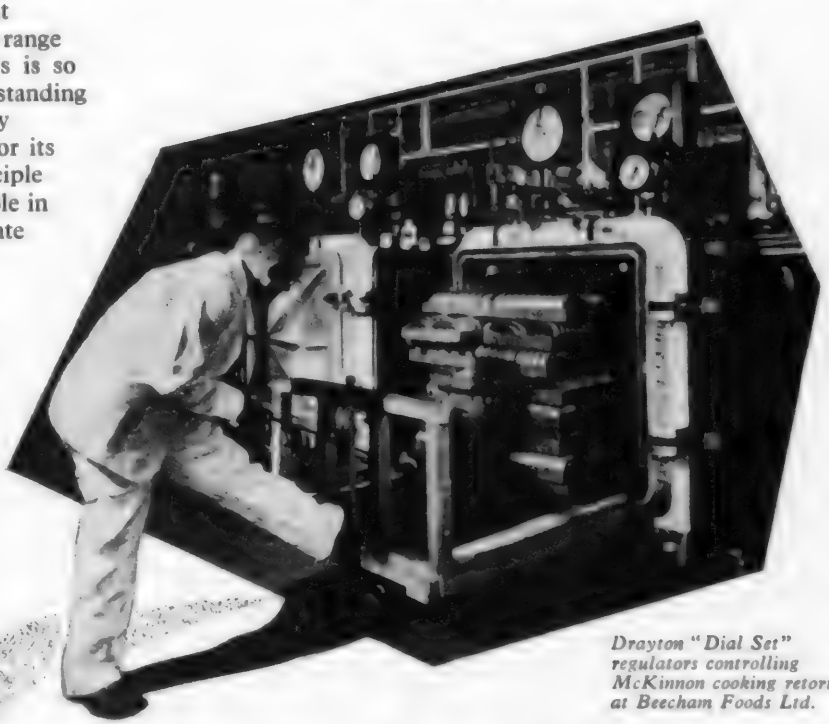

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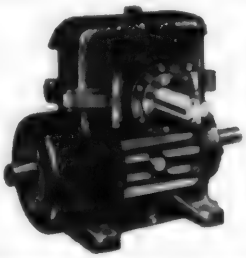

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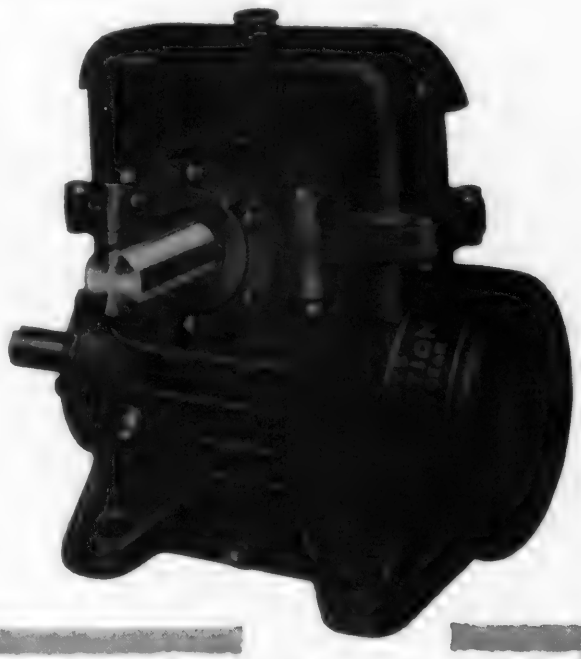

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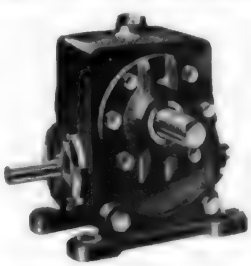

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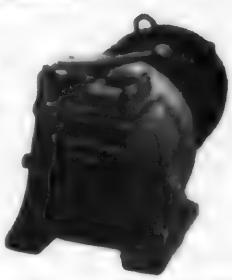

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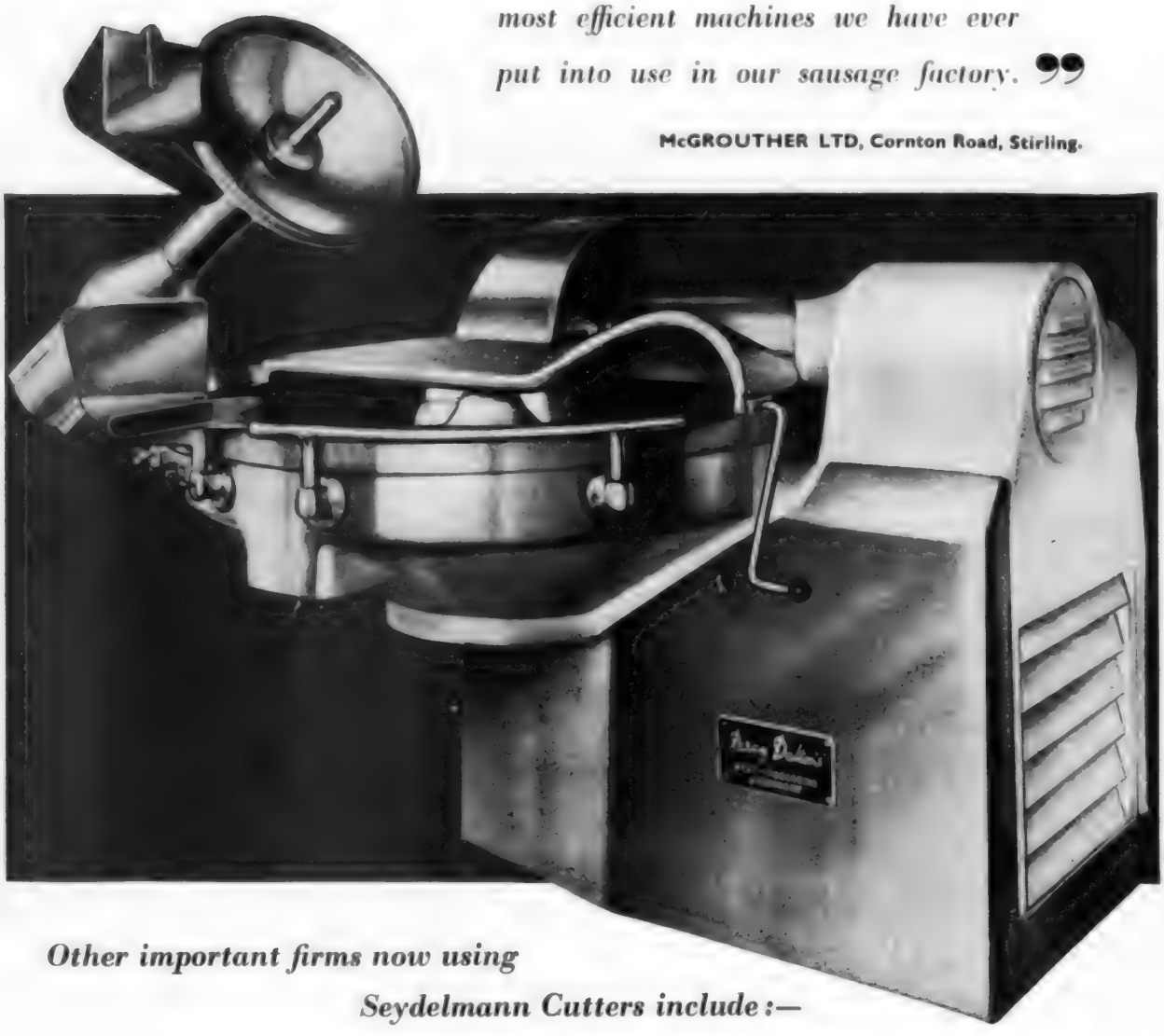

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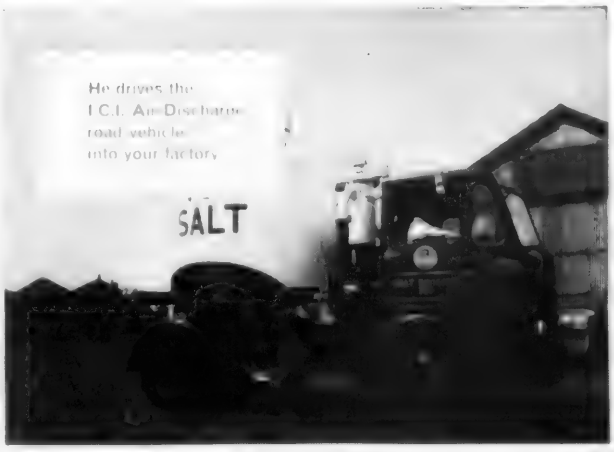

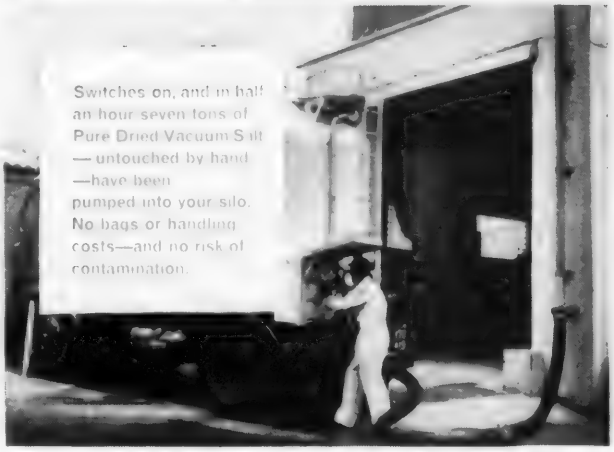
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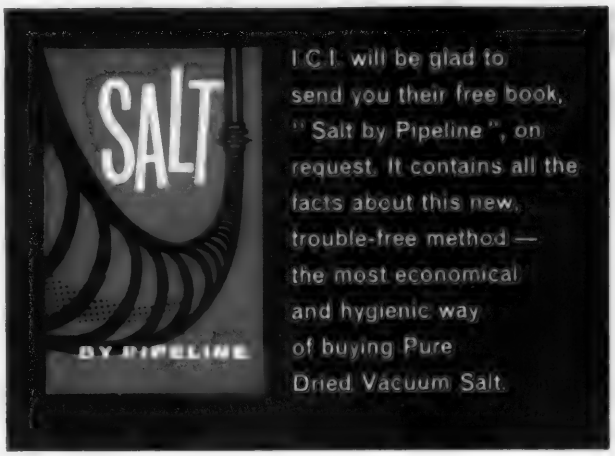
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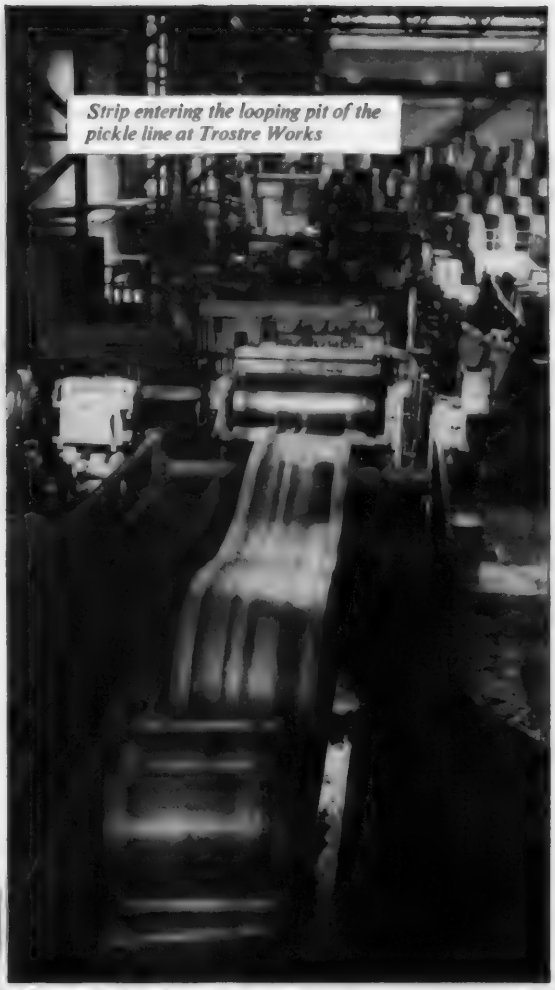
THE STEEL COMPANY OF WALES LIMITED

The entry end of an electrolytic tinning line at Trostre Works

Tinned strip entering the cutting and classification section of an electrolytic tinning line



Strip entering the looping pit of the pickle line at Trostre Works

ENQUIRIES for Tinplate and Blackplate products to:
The Sales Manager, Carmarthen Road, Swansea, Glamorgan.

The exit end of one of the latest electrolytic tinning lines at Velindre Works

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The JOHNSON-VILVER range of industrial lifting platforms is of simple electro-mechanical design, which affords considerable saving both on capital expenditure and installation costs in comparison with hydraulic and other orthodox lifts. The small sizes, for instance, require an excavation of only 4 ins., and the range extends to 15 tons capacity.

The 15 ton model type R.V G has a lifting speed of 10 ft. per minute and is operated by a 6 h.p. motor coupled to a reduction gear, coupled in turn by shafts to 4 screwed rods sunk below the level of the platform, the size of which is 23 ft. 3 ins. by 7 ft. 7 ins.

Type B (*illustrated*) has a 5 ton maximum load, and a lifting speed of 40 ft. per minute. The motor is coupled directly to a worm gear box, coupled in turn to a wire rope drum with hoisting ropes to each corner of the platform, size of which is 9 ft. 10 ins. by 6 ft. 7 ins. Compensating gear ensures that the platform will always remain level.

Also with a 5 ton maximum load, but with a lifting speed of 10 ft. per minute, the Type C platform (*illustrated*) is operated on 4 columns by a 5 h.p. motor coupled to a reduction gear and screwed rods.

The 'Cadet' (*illustrated*) is the smallest model with 1½ ton maximum load. It is available with 3 speeds: 5 ft. per minute (1 h.p.); 10 ft. per minute (2 h.p.); and 20 ft. per minute (5 h.p.). Operation is through the motor spigot mounted to a gear box driving a vertical screw encased in a single guiding column.

The range is comprehensive enough to allow platforms to be 'tailor-made' to individual specifications and a consulting service is available. Enquiries should be addressed to:

(LEFT TO RIGHT) CADET, TYPE B AND TYPE C

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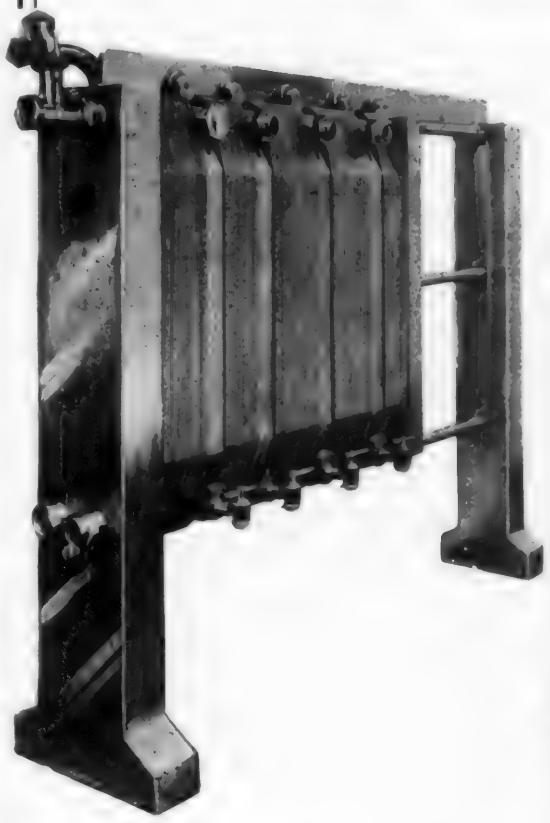
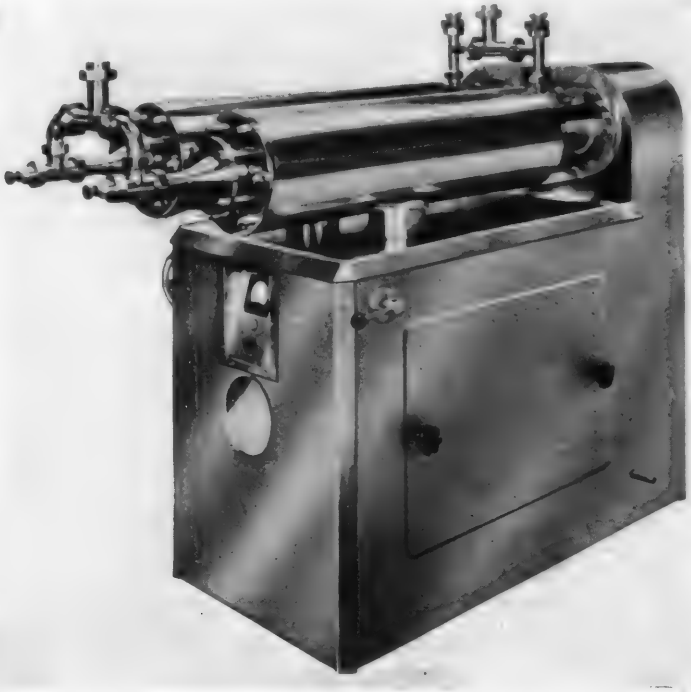


Clarke-Built Plate type Heat Transfer

for cooling through the higher temperature ranges. Secret of its perfect heat transfer is in the unique 'knob'-embossed design of each Clarke-Built one-piece Stainless Steel plate. The combination of unique plate design and improved flow principle produces quicker and better heat transfer with economies in refrigeration, manpower and floor space.



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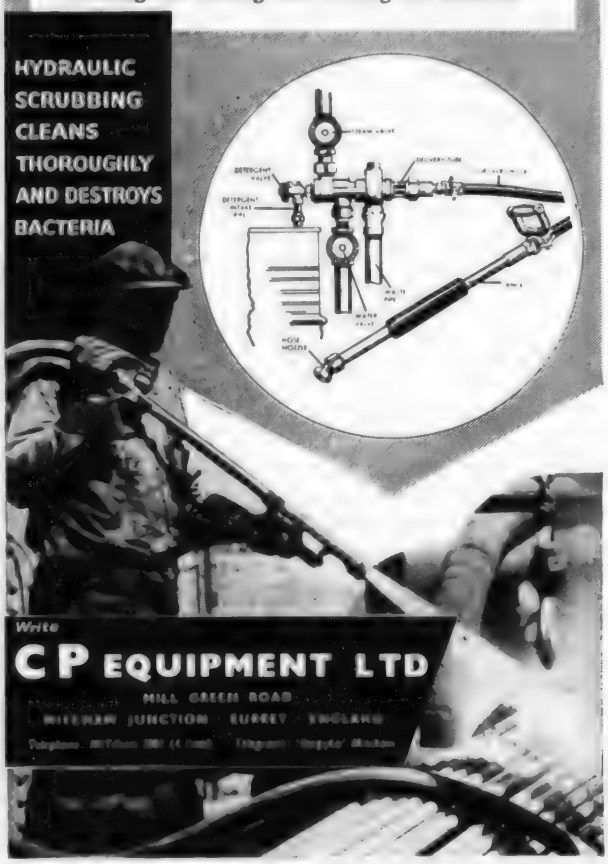

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with choice of petrol or diesel engine

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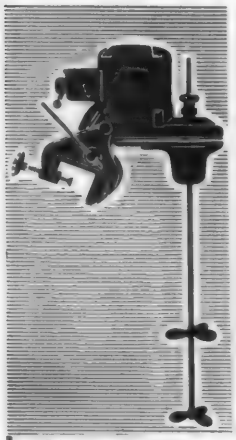
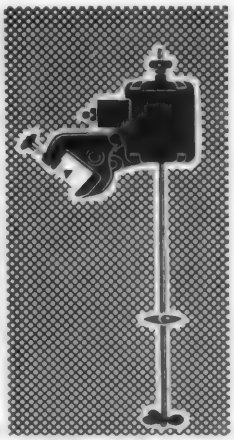
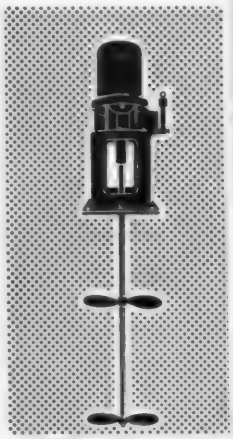


GA type 460 r.p.m. medium speed fluid mixer.



AD type 1450 r.p.m. high speed mixer.



GVD propeller type 460 r.p.m. heavy duty permanently mounted mixer.

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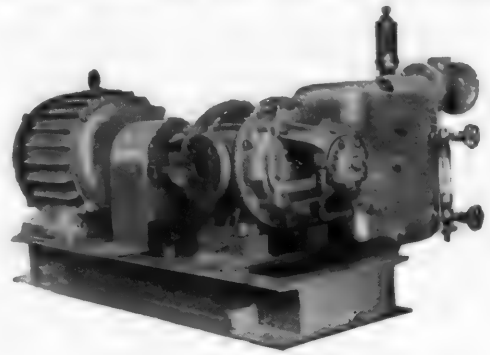

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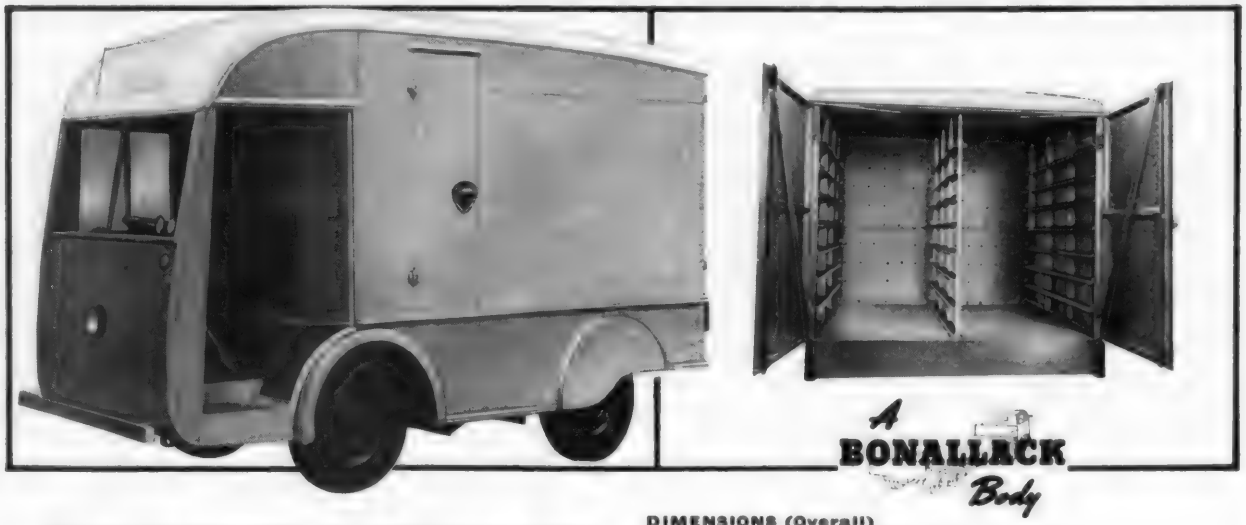

The less the deadweight, the greater the pay-load—that is the fundamental of all BONALLACK body construction. This body (mounted on a 10 cwt. Morrison Electric) provides the greatest possible pay-load for the total capacity of the vehicle.

There is nothing deceptive about the clean, streamlined appearance of this Baker's van, either: it looks, and it is, just the job for the job.

Your roundsman will be happy with 48 trays in the main body, carrying 720 loaves. In the front compartment he can take either another 192, or use it for pastries and cakes; and tray operation is as simple as pie.

It is 100% hygienic, very light, exceptionally strong, and will give years and years of service.

DIMENSIONS (Overall)
Length 11' 9½", width 5' 7", height from ground 8' 1".

DESIGN
An all-metal, rustless, hygienic body, constructed in two compartments; the front racked transversely with side doors, the rear racked longitudinally with double rear doors. Separate driver's compartment, full width seat, and full depth partition. Stressed-skin doors with sliding windows in polished frames can be provided as an optional extra.

CONSTRUCTION
Built in fully heat-treated aluminium alloy sheet and extruded sections, with argon-welded frames and riveted racking. Roofed in translucent fibre glass (tinted at option) with shaped front fascia board and integrally bonded alloy frames and ventilators.

VARIATION
Quotations are available for this type of body adapted to other chassis.

BODY-WEIGHT
6½ cwts.

PRICE
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Established 1825

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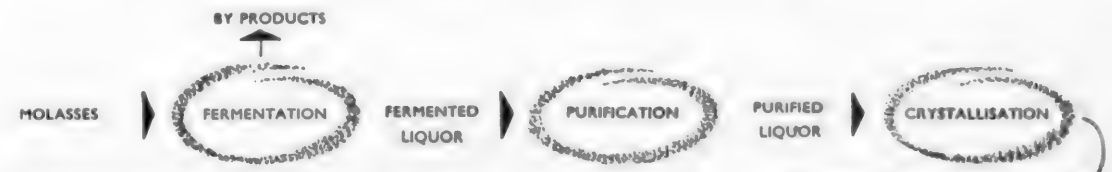
As the spores feed on the raw material and form a mould, considerable heat is generated. After several days, when the conversion to acid is complete, the solution undergoes several stages of refining before emerging as the pure citric acid for which Sturge is famous throughout the world.



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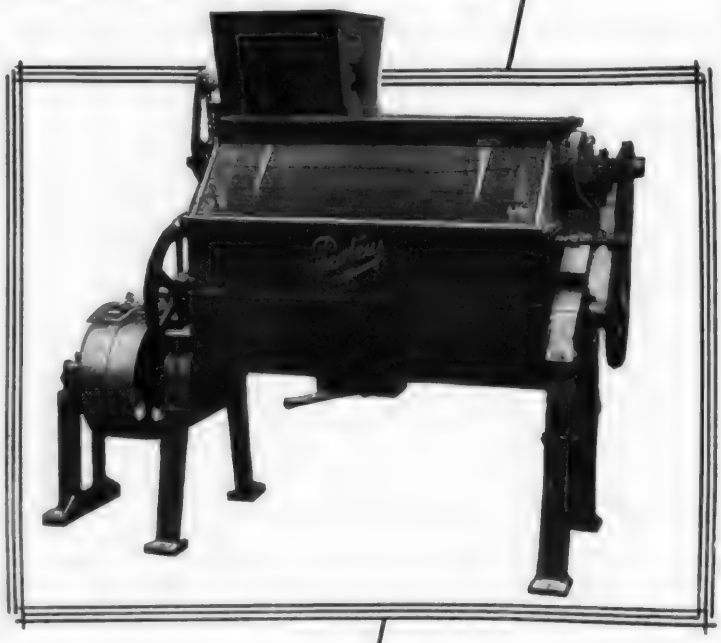

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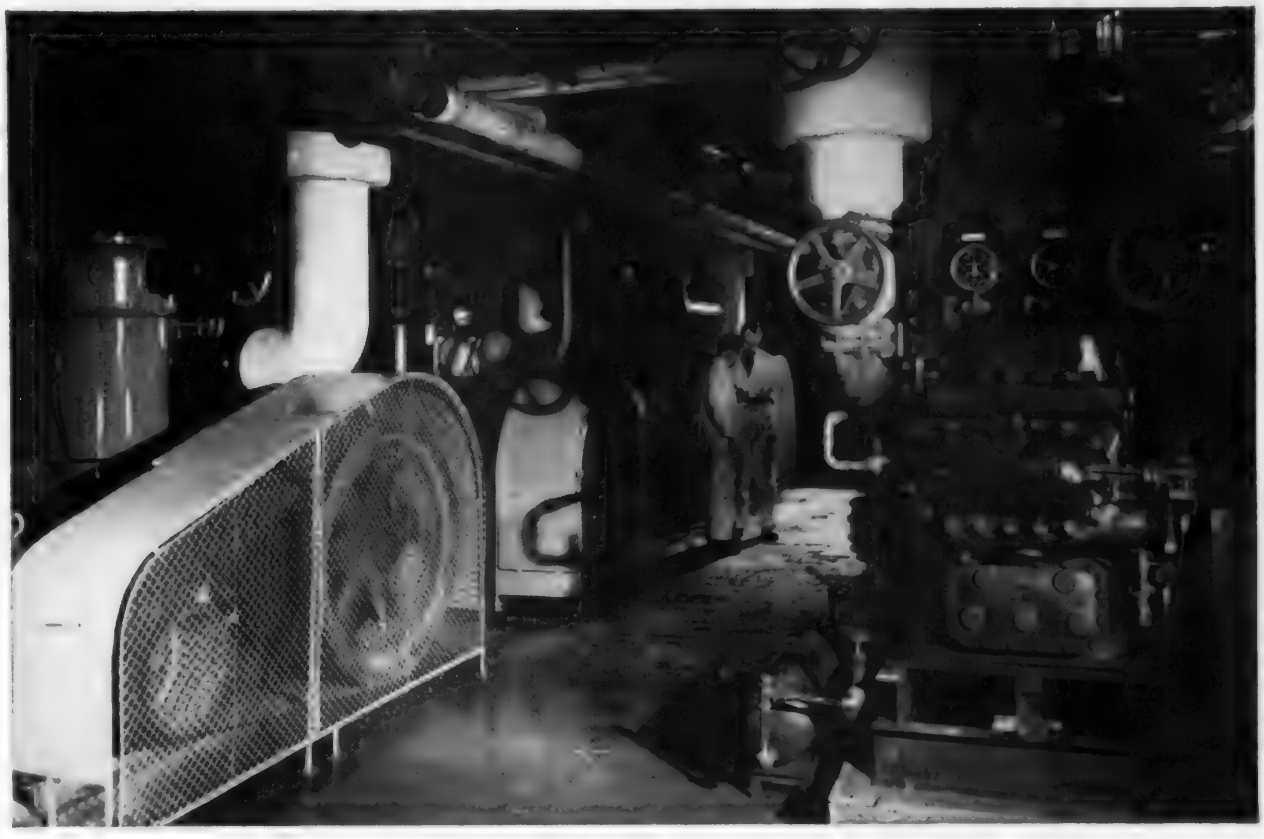

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MAIN REFRIGERATION CONTRACTORS:

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In addition to its outstanding size and efficiency, this installation is remarkable for the exceptionally high standard of the safety precautions that have been designed into the plant.

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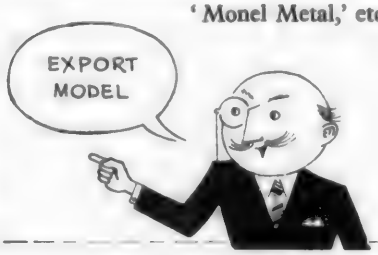

Stainless Steel Pilot Plant
consisting of a small scale Double Effect Evaporating Unit complete with Extraction Pump. Specially designed for export, this plant incorporates the same type Evaporator as is used on Bennett's industrial size plants operating on Milk, Whey, Malt Extract, Glucose, Tannin Extract, etc.

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1. A new optical system permits more accurate calibration, facilitates lamp and cell replacement and ensures that all instruments will give equivalent results.
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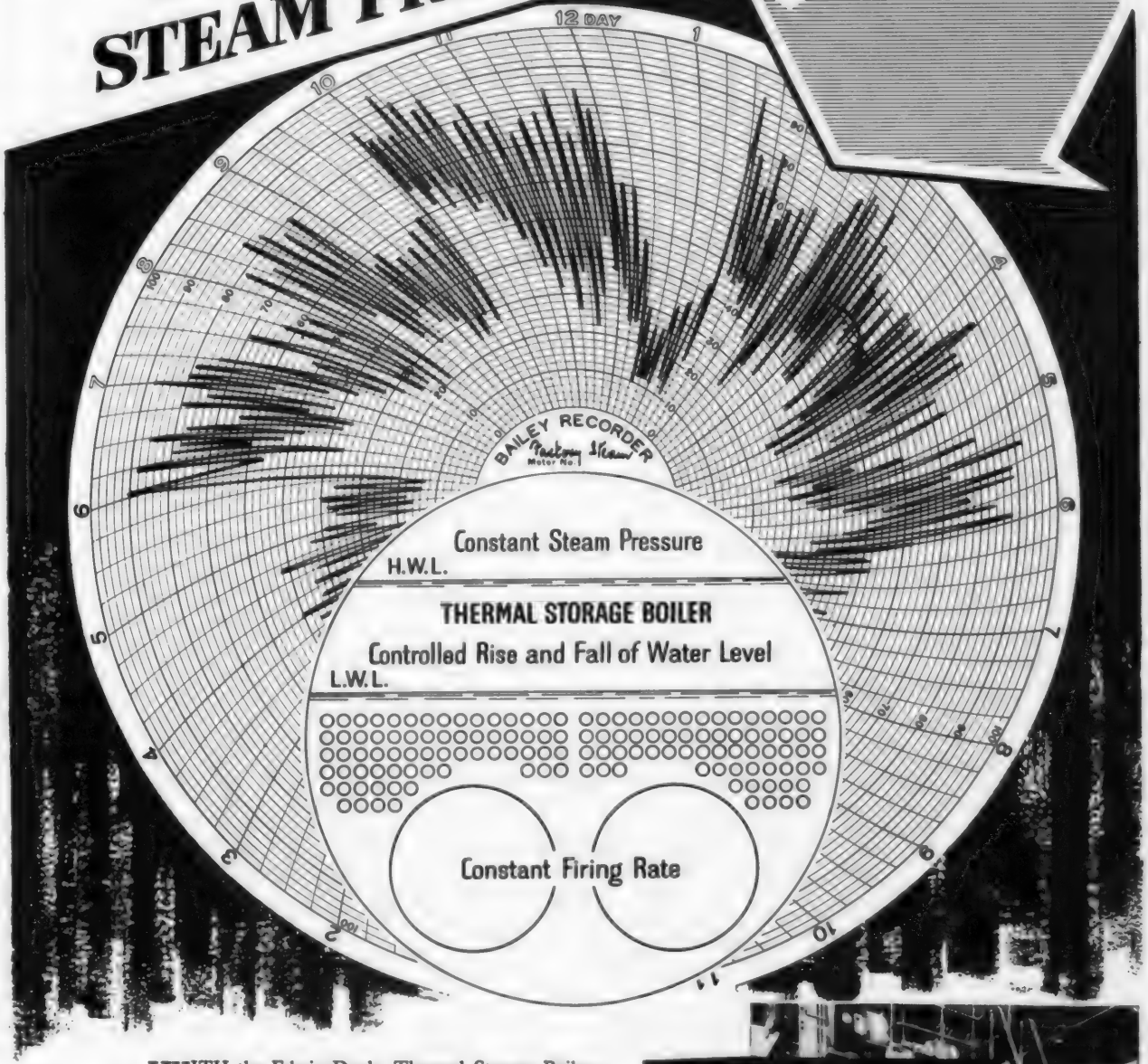

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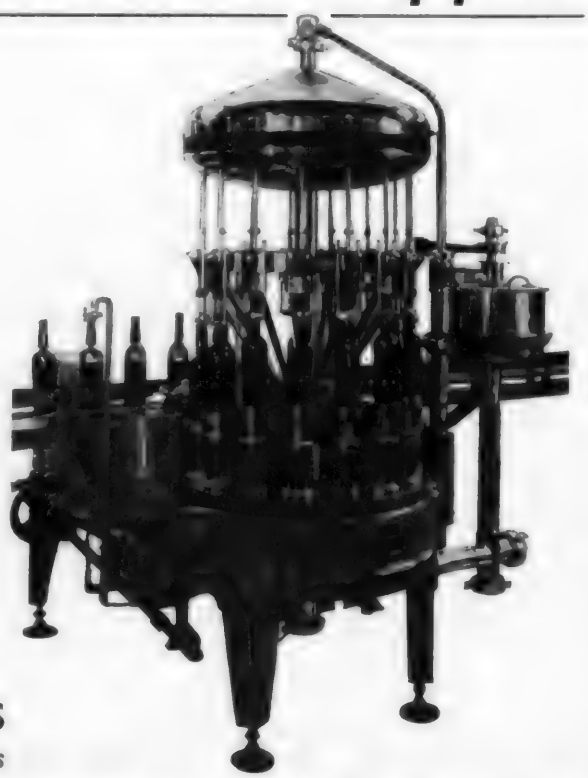

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* *The Overseas name for Golden Glow.*

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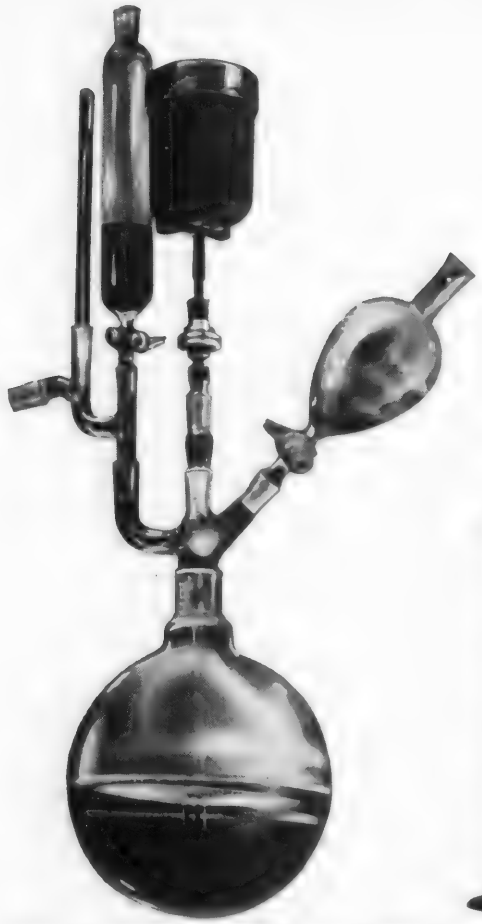

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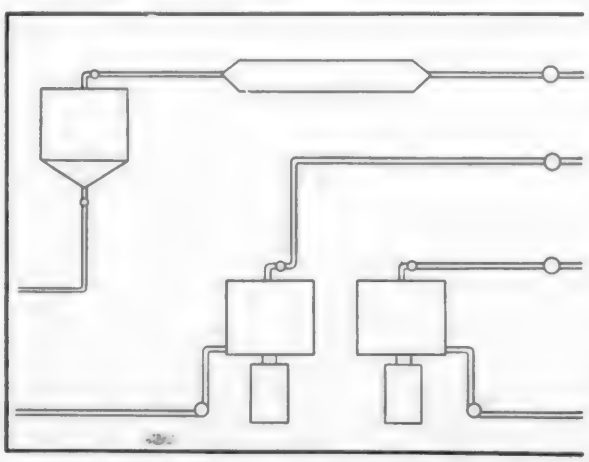

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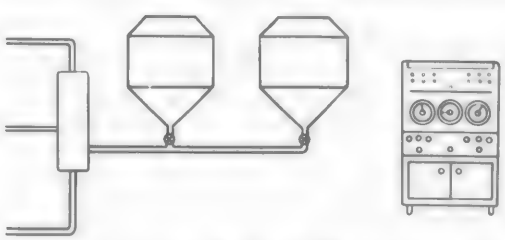

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(g) Meters with automatic presettable indicators that enable the operation of valves, pumps and warning devices.
(h) Complete panels with auto preset indicators, signal lamps and push buttons for wall mounting or free standing.
(i) Schemes involving a number of meters dispensing liquids to one outlet.
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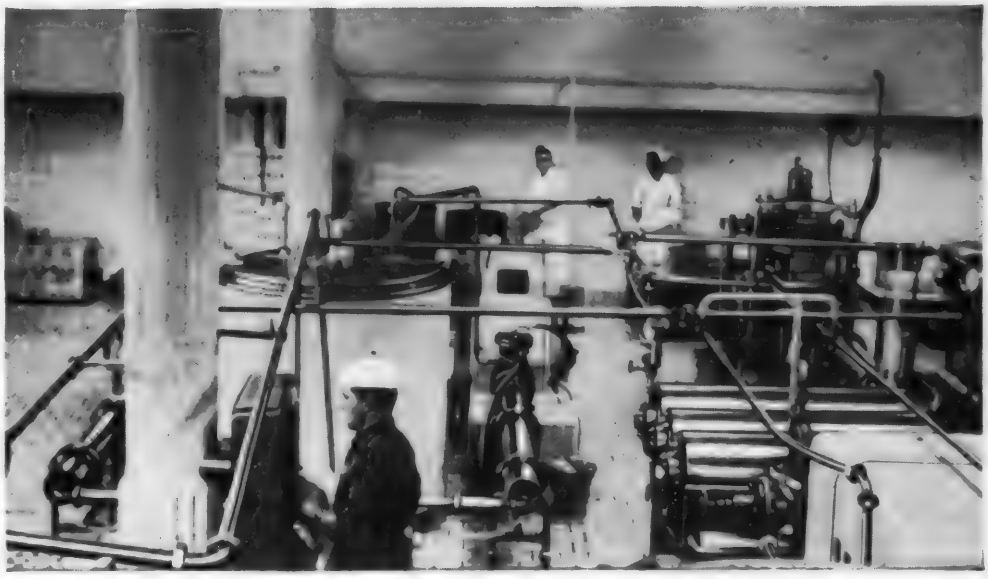

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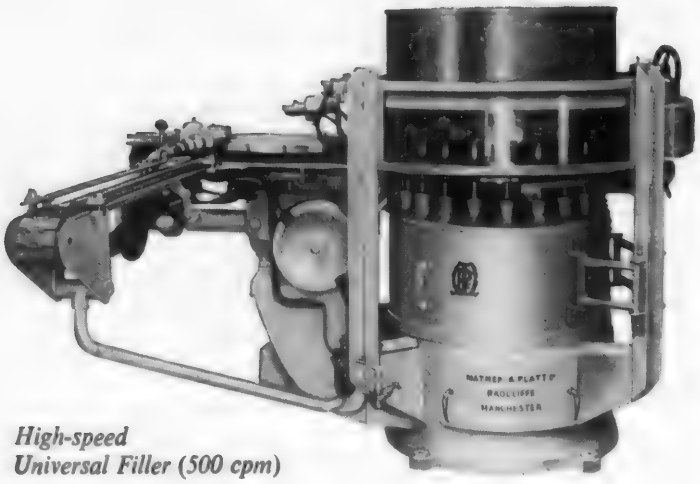

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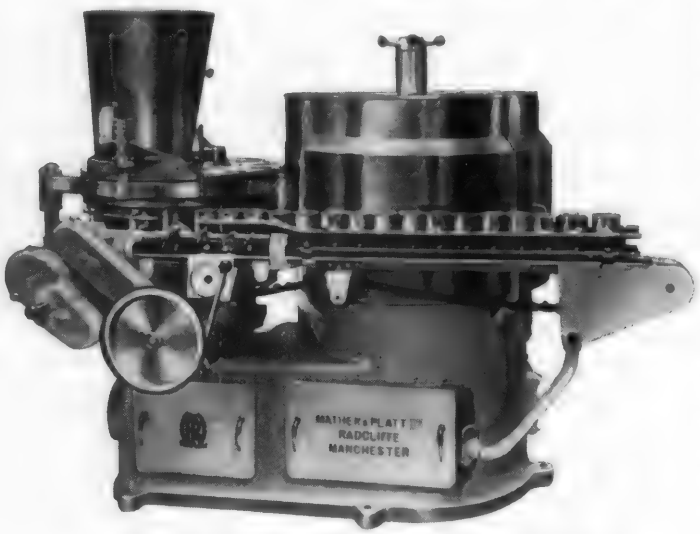

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FOOD MANUFACTURE

Volume XXXIII. Number 6 Published Monthly June 1, 1958

Editorial - - - - - - - - 221

LABORATORY EQUIPMENT:

Laboratory Control of Kraft Foods - - 225

Laboratory Furnishings and Equipment - 230

Science and Sugar Confectionery. *By A. G. Lipscomb, B.Sc., Ph.D., F.R.I.C., F.I.S.* - - - - - - - - 240

Elimination of Pathogens from Frozen Whole Egg—1. *By C. L. Heller, N. R. Knowles and K. Bryce-Jones* - - - 245

Fundamental Aspects of the Dehydration of Foodstuffs—2 - - - - - - 250

Repairing Water Pipes by Freezing - - 252

Advances in Food Technology - - - 253

Machinery and Equipment - - - - 254

News Digest - - - - - - - 257

Food News Overseas - - - - - - 260

Packaging - - - - - - - 262

New Companies - - - - - - - 263

Trade Marks - - - - - - - 263

New Patents - - - - - - - 264

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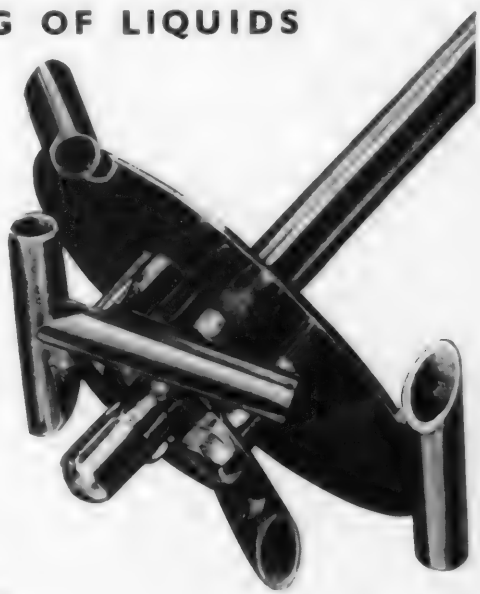

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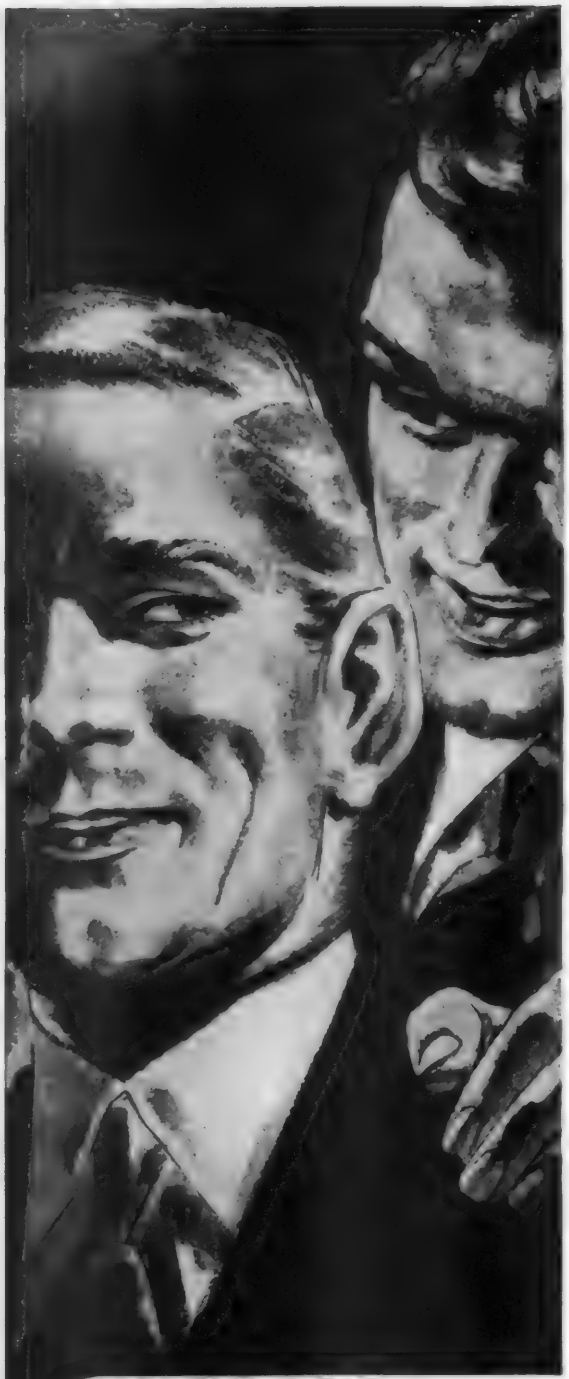

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FOOD MANUFACTURE

Vol. XXXIII, No. 6 June 1, 1958

Curers now get kicks

THE National Farmers' Union, the British Bacon Curers' Federation, and the Fatstock Marketing Corporation, have recently expressed considerable alarm at the decline in the sales of home-cured bacon, and at what they consider to be the inadequate steps taken by the Government to meet the threat from overseas—mainly Danish—suppliers. It would now appear, however, that there is some difference of opinion, at least at the branch level, between these organisations themselves. At a recent meeting of the Shropshire branch of the N.F.U. dissatisfaction was expressed at the way English bacon is cured, and an enquiry into the whole question of curing and distribution was called for.

The Minsterley Branch, in a special resolution, declared that English bacon was unobtainable in rural areas, and speakers supporting the resolution said that this was because English bacon would not keep; it had to be sold immediately or thrown away. It was claimed that farmers had their standards to maintain, in producing the live animal, and did so, but that the curers did not maintain the standard in the bacon. It was also claimed that the Minister of Agriculture was most careful about the pig until it became bacon, but did not care what became of it afterwards.

Mr. J. S. Bourne, the county chairman, said that the N.F.U. must have evidence of the bad curing which was claimed by some speakers to be prevalent. He pointed out that one of the difficulties in instituting standards for curing was that there are up to 17 curing methods used in this country. In Denmark, he said, there are only 3. It was further pointed out that allegations of unsatisfactory curing of English bacon were already being investigated, and that whilst the British Bacon Curers' Federation did not claim that all British bacon was cured perfectly, it had already issued a memorandum on good practice to curers in general, impressing on them the necessity of maintaining consistently good standards. An endeavour was being made, it was declared, to make any poor curers either change their ways or go out of production.

Things have indeed come to a sad pass if, as was repeatedly claimed at this meeting, the village shops of England are having to throw home-cured bacon away, and rely exclusively on an imported product. Yet it will be a great pity if this already vexed question is to be further bedevilled by charge and countercharge between the parties most directly concerned. It is quite beyond belief that the British curers cannot produce bacon of as high a quality as that supplied by their Danish competitors. Whether they can maintain the old quality at a fully competitive price—or whether they can afford to risk a fall in quality in their efforts to produce at this price—are questions which sooner or later will have to be frankly asked and answered. In the meantime, a detailed costing of the British and Danish industries, setting out precisely and side by side the costs incurred by pig rearers and bacon curers in the 2 countries, would make interesting reading for anyone trying to reach an objective conclusion in the matter.

A high price for cheap butter?

AT last the Government has made a move to halt the dumping of subsidised butter in this country by asking Sweden, Finland, and Eire to eliminate the practice or keep their exports within agreed limits, and by restricting imports from other sources. Even so, considerable amounts of heavily subsidised butter will still be allowed to be imported, and it is doubtful whether New Zealand and Denmark will feel that their protests on this subject have been completely answered.

It would certainly seem that these cheap supplies, if they are allowed to continue, will cost the country dear in the long run. As has recently been pointed out, New Zealand sent nearly 3 million cwt. of butter to this country last year, and Denmark over 1,700,000 cwt., together about 65% of our total imports. Total exports from New Zealand to this country were valued at over £183 m., and those from Denmark at over £114 m., and these earnings allowed the two countries to buy nearly £140 m. and nearly £85¾ m. worth of British goods respectively. New Zealand has already announced that she may have to settle a balance of trade deficit by a cut of £50 m. in imported British industrial goods, and unless she can get an economic price for her produce in this country this is her only available course.

Though they have been—surprisingly—less vociferous about it, the dumping of butter naturally affects British producers equally. British farmers have undoubtedly done a magnificent job in raising the level of our agricultural production by a cash value of £400 m. per year since 1939. When it is remembered that our average favourable balance of trade over the last 10 years has amounted to only £32 m. per year, the cuts in our imports which would have to have been sustained but for the continued efforts of our domestic food producers can readily be appreciated. One can hardly blame them if they now ask for some assurance that their continued efforts will bring in a reasonable return.

In a world which seems firmly caught in a universal spiral of inflation, the causes of freer trade and cheaper food hold out great attractions, to the politician and the public alike. Yet if the price we are to pay is the loss of confidence of two of our oldest and most reliable suppliers, and the decline of our domestic agriculture, we shall find that our economy is on this occasion very misplaced.

Europe as a market for canned foods

THE potentialities of the increase in European trade inherent in the proposed Common Market and other similar schemes have perhaps not been fully appreciated by British food manufacturers. It is, indeed, difficult for many firms to obtain a comprehensive idea of just what these potentialities are. The recent action of the Metal Box Company in compiling a report on Europe as a market for canned food will therefore constitute a very valuable service, at least to one section of the industry.

The report takes brief account of the technical and sociological factors which have contributed to the growth of the canned food trade in Europe, and then goes on to outline the pattern of production of the most important groups of canned foods. Taking these groups in turn, it then gives a brief outline of the pattern of demand in various European countries, giving some idea of the potential market when this can be assessed. Patterns of marketing and channels of distribution are then briefly discussed.

The report ends with 4 tables, summarising respectively the imports, production, exports, and per capita consumption of the major classes of canned foods in the principal countries in western Europe in the years 1938, 1955, and 1956.

No report which is as general in its coverage as this can pretend to give a detailed analysis of the market potentialities for all classes of canned goods in every country mentioned, but it will undoubtedly provide a very useful foundation of information for any canned food manufacturer seriously contemplating entering the Continental market.

Cheaper wine-making

METHODS which may effect considerable economies in the production of wine were described by Dr. B. N. Dickenson, technical director of an American firm, at a recent meeting of the American Chemical Society. Discussing the use of ion-exchange techniques in wine-making, he described how conventional procedures of settling and fining, which add considerably to the cost of production, can be largely eliminated by the use of suitable ion-exchange resins. The technique is not a new one, but activity in this field has recently been stimulated by the official approval of the U.S. Treasury Department.

The action of the ion-exchange resins is to remove from the wine those substances which cause cloudiness and inferior taste that are normally allowed to precipitate naturally during the prolonged maturation process. The resins may be brought into contact with the wine in columns, but there is apparently some advantage in using them on a batch system, especially for the small producer. When treated in this way, wines are said to be free from bitartrate instability, and other undesirable constituents such as heavy metals, proteins and tannins are also removed.

Little or no capital expenditure is necessary for the adoption of these ion-exchange methods of clarification, and there is no undesirable dilution of the wine. Whether they will ever be adopted for chateau-bottled wines of the vintage type it is impossible to say, but they would appear to offer outstanding advantages to the makers of cheaper wines.

Starving salmon

SCIENTIFIC developments have undoubtedly made an enormous contribution to the raising of the level of agricultural productivity throughout the world. Yet we are perpetually being reminded that any interference with the balance of nature inevitably brings unlooked-for consequences. Perhaps the most recent example is provided by a report from the Fisheries Board of Canada that the total river and sea landings of salmon for the Canadian Atlantic coast for 1956 were less than 2½ million pounds—about half the average for the last 25 years. It is thought that the spraying of woodlands with D.D.T insecticides has severely affected the larger stream insects, with the result that the salmon are being deprived of their food supplies in the first years of their development. After extensive woodland spraying in one river area in 1956 it was found that young salmon, spawned in 1955, were practically reduced to extinction. Experiments are now being planned to re-establish some of the missing species of insect, but how these will survive future spray programmes is not clear.

Corrosive lollies

DENTAL authorities have long been aware that eating sweets is a potent cause of tooth decay, particularly in children. It has now been reported by the Medical Research Council that fruit drinks and iced lollies have a similar effect. The link between the two findings is not hard to see—on the one hand, sugar residues in the mouth are fermented to acids, which attack the teeth; on the other, the acids are already present in considerable concentration in the substances consumed. Fruit flavoured sweets, acid drops, and even the orange juice supplied by the Ministry of Health have all been shown to be similarly suspect.

It was once remarked that all the most enjoyable things of life are either illegal, immoral, or fattening. One can hardly blame the rising generation if it should add the rider—"or condemned by dental authorities." It is reported that the experiments which led to these recent findings were carried out on rats. The more precocious of our offspring will undoubtedly believe that they were inspired by a not-too-remotely-related species.

Squaring the sphere

FASHIONS impose their demands on many sections of industry, not least the food trade. The strong pickles relished by grandpa, the full-blooded cheeses and well-smoked hams of a generation ago, the clotted cream that provided the final touch to many a high tea, have all given way to the demands of more delicate—some would say frankly less robust—palates. Now the shape as well as the flavour of things to come is being altered by public demand. So strong has become the preference for square or oblong cheeses that Dutch manufacturers are being forced to abandon the traditional spherical form of their Gouda and Edam cheeses and make them square.

The greatest demand for this change in shape appears to be coming from German housewives. Since 1956, in which year Germany imported some 37,000 tons of Dutch cheeses, German housewives have begun to change to Danish cheese, which is produced in cubic form. So far as the preference can be rationalised at all, it seems that less waste is experienced with cubic cheeses, from which the rind can be more readily removed.

The new square Dutch cheeses will have a plastic skin, and will be easier to cut, though it is feared that the traditional characteristics of a product which has been made since the Middle Ages will be lost to some extent. The changeover will not be without expense to the manufacturers, for the moulds are made of teak, a very costly wood, and globular moulds which have been in use for many years will have to be replaced with new ones of cubic form.

Tenderisation of meat

THE idea of tenderising meat by the application of proteolytic enzymes has for a long time held a strong appeal. Many cuts of meat which are well flavoured and equally as nutritious as the so-called prime cuts lose much of their value on account of their toughness when cooked, and any method of rendering them tender would be of enormous economic value. The use of enzymes for this purpose goes back, in actual fact, to long before the nature of enzymes was even dreamed of, for Cortes, over 400 years ago, found the Mexican Indians using papaya to soften tough beef by wrapping the meat in the leaves of the tree.

Several attempts have been made to produce preparations capable of producing the desired effect, but in this country at least they have never met with a great deal of success. It has been found extremely difficult to get the enzyme solution to penetrate any but the extreme surface layers of the meat, and it has been found in general that if sufficient time was allowed for the enzyme to exert an appreciable softening effect on the connective tissue responsible for the toughness, its effect on the muscle fibres at the same time was so severe as to cause a general mushiness in the meat, and the development of atypical peptide and amino acid flavours.

Judging by recent reports, however, American manufacturers seem to have met with more success. The U.S. Government permitted the use of enzymes by meat packers in 1955, and they are now reported to be using over 20,000 gallons of tenderising solution a month. Papain, derived from the papaya tree, bromelin, a constituent of pineapples, and ficin, obtained from figs, are all used, the first-named in the greatest preponderance. An enzyme tenderiser produced by fermentation in much the same way as antibiotics is also being marketed.

In practice, meat is dipped in the tenderising solution for about 60 seconds and is then immediately frozen to halt the enzyme action. One meat packer is reported to be testing the feasibility of overcoming the penetration difficulty by injecting the tenderising enzyme directly into steers immediately before slaughter, so that it is carried in the blood to all parts of the flesh.

So far, use of these commercially produced enzymes seems to have been confined largely to meat packers, but work on the production of material satisfactory for home use is said to be progressing. However, results are naturally more pronounced with the tougher, leaner types of meat, and the method may remain one essentially for manufacturers. Meat processors in this country who have to contend with the tougher cuts will no doubt watch developments with particular interest.

Fishy flavours in foods

THE South African Fishing Industry Research Institute has just issued an important report (No. 79) dealing with the development of fishy flavours in food. The report deals mainly with poultry and pig products as these are affected by the feeding of fish meals and fish oils.

Studies on the problem by different investigators have given considerably different results. With eggs and poultry, one set of experiments has shown that satisfactory flesh and eggs can be obtained using diets containing as much as 25% of pilchard meal. The report quotes these and other results which support the theory that fish products in the diet do not cause fishy flavours in poultry flesh, and that the laying of fishy-flavoured eggs is a characteristic of individual birds and is not affected by their diet.

Experiments carried out in America, on the other hand, have shown that sardine, menhaden, or herring meal in the diet of turkeys at a level of 10% causes fishy flavours in the cooked flesh. It is suggested that turkeys are more susceptible than ordinary domestic fowl to the influence of fish products in their diet, and that these should be omitted for at least 8 weeks before the birds are marketed.

Experiments in this country have shown that when pigs are fed low-grade cod liver oils at a 10% dietary level for the last 91 days before slaughter, pork, ham, bacon and sausages obtained from the animals all have some degree of fishy flavour, the effect being most marked with the cured products. Similar feeding of olive oil was shown to be without effect.

It would seem from these reports that there is some confliction of results, or that very marked species differences occur. The position is also rather confused with regard to the vehicle by which fishy tastes are transmitted. Hilditch has shown that when pigs are fed on fish meal the ingested fish fats appear in the lard, and it certainly appears likely that fats are intimately concerned with this flavour propagation. Lea has shown, however, by feeding tests with pigs, that although the feeding of cod liver oil increases the susceptibility of the extracted fat to oxidation, there exists no correlation between fishy flavours and peroxide value. It would seem that fishy flavours depend for their existence on a certain degree of oxidation, but that they depend mainly on the existence of certain particular substances, which may be fatty acids peculiar to fish oils, or, more probably, nitrogenous substances in association with fatty acids. Trimethylamine oxide is without effect in itself, but a combination of trimethylamine oxide with unsaturated fatty acids may give rise to potent causative agents.

On the other hand, practical experience in Denmark has shown the danger of using even extracted and almost fat-free fish meals for feeding bacon pigs, and little or no fish meal is used for this purpose in that country. In Norway, similarly, it is considered that all fish meal should be omitted from the diet after the animals attain a weight of 70 kg., and in Holland herring meal is not used after 50 kg. live weight nor for a minimum of 4 months before slaughter.

Protecting the world's food

OFFICIAL figures can frequently be disconcerting. Yet few are quite so staggering as those quoted recently by the Rt. Hon. Tom Williams, M.P., former Minister of Agriculture, when he opened the Crop Protection and Pest Control Exhibition organised by our companion journal, *World Crops*. Discussing the ravages of insects, vermin, and crop diseases, Mr. Williams said that experts now estimate that some 30% of the world's agricultural production is lost each year from these causes. In terms of grain alone, he said, the annual loss according to FAO estimates amounts to 65 million tons per year. Even in Britain, where, as Mr. Williams remarked, we are more pest conscious than in many countries, the losses due to pests in 1947 were equivalent to the production of 33,000 farms of 35 acres each, and accounted for the total loss of the production of 51,000 skilled workers.

If these figures are correct—and we have no reason to doubt them—the international Exhibition which Mr. Williams was opening, which was the first of its kind in the world, has long been overdue. Many conferences have been held on crop protection and pest control, but never before have firms been able to show and demonstrate their products at a specialist exhibition devoted exclusively to these vitally important subjects. Over 50 concerns took advantage of these facilities, and the interest aroused by the exhibition throughout the world is evidenced by the fact that no less than 61 overseas Governments sent representatives, whilst applications for tickets were received from 111 countries. Enquiries have already been received as to when the next exhibition will be held, and although it has not yet been decided whether to make it an annual or a biennial event, its success clearly calls for its repetition in future years.

If the population of the world is to increase from its present level of 2,700 millions to 4,000 millions by the end of the century, as the experts say it most surely will, then a very considerable increase in the world's food resources will be necessary, and losses of food such as have been described above simply cannot be tolerated. There is no doubt that this exhibition has a major part to play in the future in helping to disseminate information on how they can best be combated.

LABORATORY CONTROL OF KRAFT FOODS

The new factory which Kraft Foods, Ltd., have built at Kirkby, Liverpool, is a model of its kind. The system of quality control exercised by the company is equally worthy of note, and in conjunction with our special section on Laboratory Furnishings and Equipment we give below an illustrated account of the way laboratory facilities are used by Kraft to ensure that production is maintained at a uniformly high standard.

TO acquire laboratory facilities for the control of food production is one thing. To establish an integrated system in which these facilities are fully and economically employed to give control over the receipt of raw materials, the correct application of production techniques, and the maintenance of a uniformly high standard throughout the finished products, may be quite another. Kraft Foods, Ltd., have now begun production at their new factory near Liverpool, and quality and hygiene have been made the ruling factors both in the building of the factory and in the design of production methods. To ensure that these good intentions are not vitiated by unsatisfactory raw materials or mistakes on the production line, they have instituted a system of quality control which is worthy of consideration by anyone engaged in food manufacture, for it provides an excellent example of the planned use of science in production control.

View of the General Chemical Laboratory, looking towards the Quality Control Laboratory.

Organisation

The exercise of quality control at Kraft's is the responsibility of the Chief Chemist, Mr. P. R. Booth, B.SC. For administrative purposes, he works mainly through the Production Director, but in fact he is directly responsible to the Managing Director, to whom he has the right of appeal in the event of any disagreement. In this respect his position is similar to that of other heads of department, such as the Chief Engineer.

To assist him, the chief chemist has two principle subordinates, the Laboratory Manager and the Plant Technician. The former is responsible for the supervision of all the general laboratory work, which is performed in the general lab., the bacteriological lab., and the edible oils lab. The general lab. is in turn in charge of a senior analyst, who is responsible for its operations to the lab. manager and through him to the chief chemist. In a similar way, the bacteriological lab. and the oil lab. are in charge of the Bacteriologist and the Oil Chemist respectively. Down to this level, all staff hold recognised scientific qualifications.

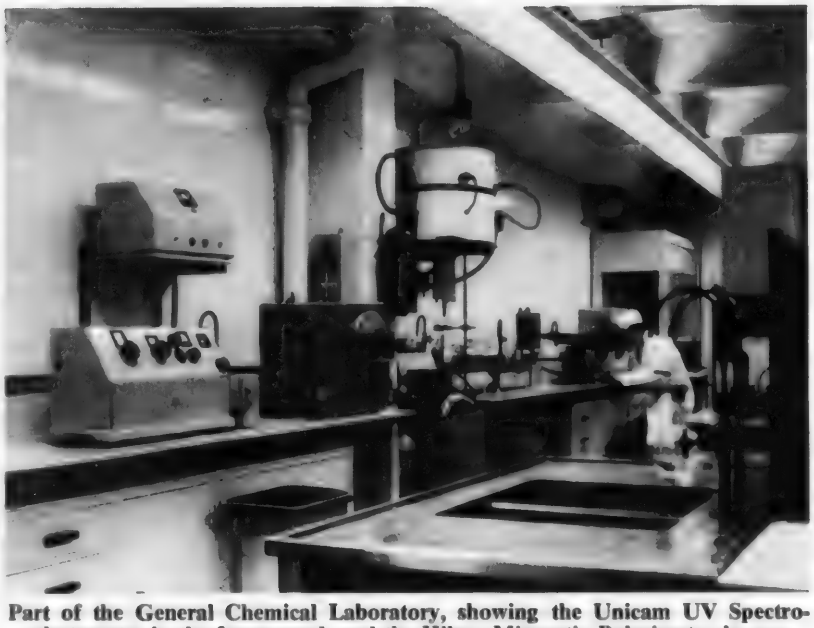
At the next lower level, the senior analyst has working under him a raw materials analyst, a process analyst, a products analyst, and a records keeper. The bacteriologist has two assistant bacteriologists, and the oil chemist has an oil analyst. In addition, there are a considerable number of laboratory assistants, mainly girls, who carry out the basic routine tests. All these have G.C.E. (Ordinary) as a minimum qualification.

On the other side of the scheme, the plant technician is in charge of the quality control laboratory, and has under him a product research chemist and two assistant plant technicians. Once again staff are all qualified down to this level. There is also in this department a quality control supervisor, and several laboratory assistants.

Duties

As was mentioned above, the laboratory manager is responsible for all laboratory work. This in-

cludes the examination and analysis of all raw materials, including packaging materials, the control of production processes by the sampling and analysis of intermediate products at certain specified points, and the analysis of finished products. He is also responsible for the operation of the bacteriological laboratory. The plant technician is responsible for liaison between the laboratories and the plant—for seeing, in fact, that laboratory control is effectively applied. He is, in many ways, a "trouble shooter," and it is his job to bring in the laboratory when he considers that any aspect of production needs investigating. In addition, he is responsible for plant sanitation, having full control of what shall be cleaned, at what time, and by what method. In general, the factory operates two day-time production shifts and a night cleaning shift, and during the latter all equipment is dismantled, cleaned and sterilised before production recommences on the following day. The control of this operation, and of all subsidiary cleaning, falls within the responsibility of the plant technician.



Part of the General Chemical Laboratory, showing the Unicam UV Spectrophotometer in the foreground, and the Hilger Microptic Polarimeter in use.

Laboratory operations

No raw material is allowed to be used until it has been sampled, examined or analysed by the raw materials analyst or the packaging inspector, and passed as satisfactory. A full-time sampler is employed, whose duty it is to obtain samples of all incoming supplies and enter full details of these on a form provided. This gives the usual details of supplier, quantity, batch number, etc., along with any comments on the appearance of the delivery. The completed form is taken with the sample to the laboratory, a copy also going to the stores office.

In the laboratory the recorder enters details of the consignment in the records, and makes out an analysis request. This is passed to the raw materials analyst, who by visual and organoleptic examination, and such physical and chemical tests as are appropriate to the nature of the sample, assesses its quality. The results of these tests, along with any comments, are entered on the analysis request form, the reverse side of which is used for noting down all essential data used in calculating the results. The decision taken regarding the consignment is then sent to the stores office on a detachable portion of the original sample note. In most cases this decision will be to the effect that the delivery may be released for production, and this is indicated on the form. Provision is also made for other decisions, however, should the results of the test not be entirely straightforward. Thus the delivery may be held pending further tests, or the chief chemist may decide that it can be accepted with certain provisos as to its use. Finally, of course, in cases of deliveries which depart from specification in some vital respect, the consignment may be rejected out of hand and returned to the supplier.

By this system, a full record is kept of the history of every delivery of raw materials entering the factory, and these records are kept for a year against any future enquiries.

As to the actual nature of the tests performed, these, of course, vary widely with the nature of the particular raw materials. All goods are bought against specification, the compilation of which is the responsibility of the chief chemist, and the main task is naturally to see that the goods conform to these specifications. With edible raw materials, examination may be made of colour, flavour, aroma, etc., and tests may be made of moisture content, acidity, peroxide value, or other important characteristics, according to the nature of the material. With packaging materials tests may be made of resistance to corrosion, bursting strength, size and other physical properties.

The only notable exception to this practice of buying according to specification is cheese, which of course represents the largest single material purchased. It has been found impossible to purchase cheese against any rigid specification, for the quality of cheese depends on properties, which defy rigid definition, and must be judged subjectively by skilled and experienced inspectors.

In the event of any delivery being at fault, the chief chemist fills out a complaint report, copies of which are forwarded to the firm's buyer so that he may take up the matter with the suppliers. This is done in the case of all departures from specification, though the

variation may not always be so serious as to involve rejection of the delivery.

Process control

Laboratory control of processing is exercised at various points along the production line, and where this control is effected one stage of processing may not be continued until the previous stage has been pronounced satisfactory. Thus, in the production of processed cheese the moisture content of the blended cheese mix is tested to ensure that fully adequate mixing has taken place before the subsequent stages of processing are carried out. This has necessitated equipment able to give rapid and accurate results, so that processing is not unduly held up, and a technique has now been devised which will provide results in 9 min.

Other examples of process control are provided by salad products and tomato ketchup. The manufacture of salad products involves the preparation of a starch base, and this is tested for acidity, moisture content and viscosity before being used. Another stage consists of forming an emulsion between this base and the salad oil, and the emulsion is tested for fat content, moisture content and acidity before the next stage of production is continued.

With tomato ketchup, several tests are made half-way through the process.

Edible Oil Laboratory, showing in the background the dilatometry thermostats.

Product samples

Every finished product is inspected and sampled at frequent intervals as it comes off the production line. The samples are held for tests on shelf-life, and organoleptic quality, and for chemical and physical analysis. Samples are taken on a regular basis for each product, though irregular samples are also taken at such danger times as lunch-hour, etc., when irregularities in production are most likely to creep in. In addition to, and quite apart from these laboratory samples, samples are also taken at frequent intervals by members of the production staff, as they are naturally eager to keep up the quality of the products for which they are responsible and to prevent laboratory complaints about them. A double check is therefore maintained throughout the day.

As the two production shifts worked at the factory cover a period of 17 hr., there are at least 17 laboratory samples of each product available for examination each day. The shelf-life and organoleptic tests performed will be discussed later. Chemical analysis of products is carried out to ensure that differences of composition do not creep in, particularly when raw materials from different sources are used. Tests for metallic content, and other qualities on which there are statutory limits also help to prevent infringements of the law, and guard the good name of the firm against possible complaints.

Quality Control Laboratory, showing some of the Room Temperature Shelf Test shelfing.

Bacteriological laboratory

The bacteriological lab. subserves two basic functions, the control of the bacteriological standard of incoming raw materials and outgoing finished products, and the maintenance of plant hygiene. Raw materials may be accepted or rejected on the basis of bacteriological quality, and, of course, no finished products are allowed to leave the factory unless they are bacteriologically sound. For the supervision of plant hygiene, swabs of equipment are taken at frequent intervals to guard against the build-up of bacteria, and to check the effectiveness of cleaning techniques.

Air-counts are also taken at periodic intervals. In those remarkably few processes which require the handling of foodstuffs, particular care is taken, even to the extent of doing finger-print tests to determine the bacterial load present on the hands of operatives. These tests are said to have been very illuminating, for on several occasions the bacterial count has been found to rise on the fingers of operatives who have subsequently reported sick. Anyone whose hands show an undesirable increase in bacterial count, whether for reasons of personal hygiene or other cause, is removed from the department.

All operatives called upon to handle food are in any case required to use a strong bactericidal rinse every 20 min., and hand creams containing mycocidal agents are also used compulsorily. Swabs are also taken on seating and other equipment to ensure that the hands of the operatives are not exposed to sources of re-contamination which would rapidly negate these hygiene precautions.

Edible oils laboratory

The edible oils lab. handles all analysis of oils, with the exception of the oil content of salad products, which is done along with their general analysis. All incoming oils are tested for keeping quality (*i.e.*, resistance to rancidification), colour and flavour, and are subjected to chemical and physical analysis. Close control is also kept by this laboratory over the production of margarine, on which task it works in close co-operation with the bacteriological lab., for the bacteriology of margarine is highly important if a successful, high-quality product is to be made.

Quality control laboratory

The quality control lab. is in charge of two assistant plant technicians, who are jointly responsible through the plant technician for its operations. One works on cheese and the other on non-cheese products and their duties include the carrying out of shelf-life tests on all finished goods. Storage tests are normally carried out in a room held at 65°F., ±5°, and at 100°F., ±5°. Some products such as salad dressing, which may be adversely affected by cold if not up to the required standard, are also tested at 40°F., ±about 2°F. Samples are kept for one month longer than their estimated life at room temperature, during which time they must show no signs of deterioration. Samples held at 100°F. must show no deterioration for at least one month, longer in some cases.

The duties of the quality control lab. also extend to the factory itself, as was mentioned earlier, and they are responsible for trouble-shooting of all types and for the maintenance of factory hygiene—in which latter task they naturally work in close co-operation with the bacteriological lab.

Organoleptic tests

In addition to the laboratory tests, a regular system of organoleptic examination, involving several grades of production staff, has been instituted as a daily routine. Samples of all products produced on the previous day are examined first by senior executives of the company, who pass judgement on their quality. Heads of departments, foremen, and charge hands are then brought in in turn, members of one panel remaining behind to discuss results with their subordinates when the occasion arises. A first-hand opinion, as well as a knowledge of the opinion of others, of the quality of the previous day's production is thus carried back to the factory floor by all staff with responsibility for the maintenance of that quality.

By this method, all levels of supervisory staff are kept fully in the picture, and any criticisms can be discussed with the sample available and with a chance given for the expression of all points of view. A real sense of responsibility and of quality consciousness is thereby engendered, as each level of staff is made to feel its importance in the organisation and to realise the value of its own task.

Exercise of control

The carrying out of control tests on a scale such as this naturally involves a good deal of labour and expense, and if full use is to be made of it, the results must be studied and applied in the factory as rapidly as possible. There is, therefore, made available to the chief chemist each morning a line-up of all the figures obtained on the previous day's production, for his examination. An order is then made clearing all satisfactory production, holding any about which there is any doubt, and rejecting any which is judged as being unsatisfactory. Goods which are judged to be slightly defective may in some instances be reprocessed, otherwise they have to be used, along with definitely unsatisfactory production, in the preparation of animal feeds, or disposed of in other ways.

Faults found in various products are reported verbally to the department concerned at the earliest opportunity, and a confirmation is sent in writing later. The chief chemist holds a conference each morning with his senior staff, at which the previous day's production and any problems concerning plant and laboratory organisation are discussed. A similar meeting is held in the afternoon by the factory manager and his production staff, at which the results of laboratory and organoleptic tests on the previous day's production are discussed, along with general production matters.

More urgent matters, of course, are dealt with immediately, and the laboratory has authority to stop the production lines at any time should the necessity arise. All laboratory staff are trained to watch the operation of the plant as closely as possible during their visits to various factory departments, and to report any irregularities immediately to someone in authority in the department concerned or in the laboratory. Immediate action can then be taken to prevent the continued production of unsatisfactory goods which will subsequently be rejected by quality tests.

Other duties

As in all laboratories, the staff at Kraft's have many duties which fall into less clearly defined categories. Thus they carry out research in the formulation and development of new products, and give scientific advice on many aspects of plant construction and control. They may at times be called upon to make various tests on products ranging from floor tiles to detergents, to devise programmes of insect control, or to test new raw materials or those from alternative sources. Changes in price often involve the possibility of new suppliers being sought, and the principle is adhered to that when a rise in price at the same quality is the alternative to a fall in quality at the same price, quality considerations shall take precedence. As the arbiter of quality, the laboratory is naturally closely involved in any decisions of this type.

Laboratory facilities

The various laboratories are situated on the processed cheese production floor, a mezzanine floor in what is essentially a single-storey factory. They are similar in construction, all being tiled to the ceiling with pale yellow tiles and equipped with floors of thermoplastic tiling. Lighting throughout is by fluorescent tubes of daylight colour. The quality control lab., in which the shelf-life tests are performed, is equipped on all sides with steel shelves, on which the samples are stored, and with a central stainless steel table on which tests and examinations can be performed. The room is held at a constant temperature of 65°F., ±5°F., and rooms at 100°F. and 40°F. are also available.

The other laboratories are fitted with steel framed, plastic-topped benches built up on a unit system, with cupboards below where convenient. Equipment in the general laboratory includes a torsion viscometer designed to give rapid but reliable viscosity readings, and a more delicate viscometer, also operating on the torsion principle, for finer work. A U V spectrophotometer is also available for colour measurement and the examination of absorption spectra. Other interesting equipment includes a centrifuge equipped with a special heating element and an automatic time switch, which is used for Babcock fat determinations. A second centrifuge, operating at 4,000 r.p.m., accurately reproduces during 81 min. running the effect of gravity, over a period of 6 months, on oil emulsions and other materials in which separation may occur.

One of the most interesting pieces of equipment is the Kraft oven, in which rapid moisture determinations on cheese-mix samples are performed. The oven is of American design, and consists of a top and bottom heating element between which the samples are carried on a small continuous chain. The temperature and the speed of passage of the sample through the oven are both highly critical, and the elements are thermostatically controlled to give a temperature of approximately 185°C. The chain carries the sample through the oven in a series of regular steps, and the whole process from initial to final weighings can be carried out in 9 min.

Equipment in the bacteriological laboratory includes two 37°F. incubators and one which is water-cooled to 21°F. Margarine cultures can also be held in a refrigerator. Microscopes include one of modern binocular design, and a magnifying colony counter is also used. Equipment in the oil lab. includes apparatus for the Swift stability test, and equipment for a more rapid method of determining resistance to rancidification. Three thermostatically controlled water baths are also available for dilatometric studies of fats, in which the proportion of solid to liquid fat at a given temperature is computed from the volume occupied by a measured quantity of the fat.

▶ The latest edition of the *Hilger Journal* published by Hilger and Watts, Ltd., contains information on X-ray spectrochemical analysis and the specification and measurement of colour.

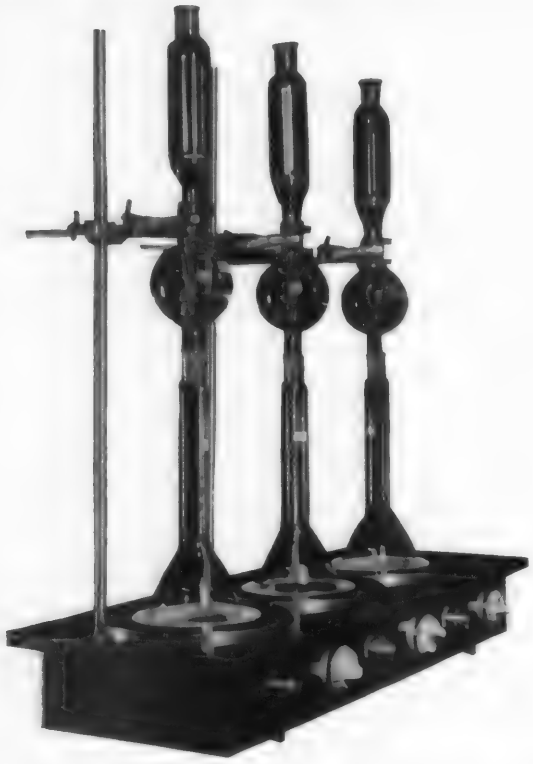
Protein Chemistry

SUCH rapid advances have been made in the field of protein chemistry in recent years that it has become quite impossible for the average industrial scientist or technologist to keep abreast of them all. In many fields of industrial activity, however, a detailed knowledge of some aspect of protein chemistry is necessary to the fully competent scientist and technologist, and this cannot be acquired without a previous understanding of the basic fundamentals of the general chemistry of proteins. In a book published recently,* the authors have the declared aim of providing a "readable, integrated, and relatively comprehensive introduction to the field," and this book will undoubtedly prove of value to the working chemist and would-be research worker in a number of "biological" industries, not least the food industry. The book approaches the subject in a logical step-wise sequence, dealing first with the chemistry of the amino-acids before passing via a discussion of peptides to the proteins themselves. After dealing with the general properties of proteins, the authors then discuss certain specific classes of protein, including enzymes.

Considerable space is devoted to describing various methods of assaying amino acids and investigating the properties of proteins, and frequent reference is made to original papers, so that anyone called upon to work in this field without having the immediate guidance of a specialist in protein chemistry (a position in which the food chemist not infrequently finds himself) will find the book a useful starting point.

* *Introduction to Protein Chemistry*. By S. W. Fox and J. F. Foster. Chapman and Hall, London. 1957. Pp. viii+459. 76s. net.

▶ The latest edition of the *V-Belt Journal* issued by J. H. Fenner and Co., Ltd., illustrates the use of some of their *S.H.O.* V-belts inside a confectionery factory. In this application, their rubber V-belts have remained unaffected by the hot, moist conditions under which they operate.



LABORATORY FURNISHINGS AND EQUIPMENT

A "FOOD MANUFACTURE" SURVEY

Laboratory Furniture

NEW materials, and new designs applied to older materials have greatly increased the utility and convenience of laboratory furniture in recent years. We describe below some of the products now being made by leading manufacturers.

Wood

A. Gallenkamp and Co., Ltd., have been making unit laboratory furniture for 25 years. Selected woods are blended with modern designs in their recently introduced "500" range.

The accompanying drawing illustrates the six basic applications of this equipment. Method A is the most simple and the least expensive. The bench top is mounted directly on to the carcase units which can be re-arranged with reasonable facility if the laboratory has to be altered, but benches so assembled are best regarded as a fixture. Cupboard units used in this way have removabe backs to give access to the services behind. Type A benches are 3 ft. high and are generally suitable for industrial, college and university teaching laboratories where a high degree of mobility is not essential. Type B benches are identical in form but only 2 ft. 9 in. or 2 ft. 10 in. high, which makes them particularly suitable for school, and some hospital requirements.

In methods C and D the bench top is mounted on timber cantilever arm units designed so that the front of the bench is not obstructed by legs. Carcase units can be moved freely beneath the bench top or removed or interchanged to suit the work in hand. Both types C and D benches are 3 ft. high, but D offers the superimposed service housing at the rear preferred by many users. Although these two methods are initially more expensive than type A, they are valuable where a degree of flexibility is essential. In consequence they are of particular use in research, radio-chemical, physical and some hospital laboratories.

A type E bench, provided with a continuous top at 3 ft., or any other height to meet special needs, is ranged in front of an entirely

Above left: **A battery of three Kjeldahl units, made by Quickfit and Quartz, Ltd.**

Right: **The edge of this Formica-topped bench has been curved from one sheet of material.**

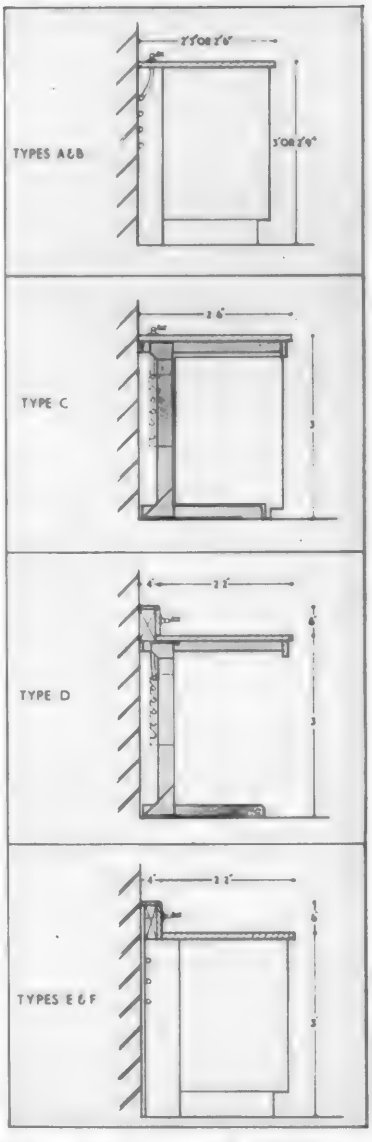
independent service unit. The whole of the working bench, including the top, can be removed to give complete access to the plumbing and services. Method F is the same except that the bench, 3 ft. high, is made up from units each having a separate working top. They are bolted together by a simple device and the tops are made continuous, with rubber-sealed joints between modules.

The module widths of the carcase units are 1 ft. 6 in., 3 ft. and 3 ft. 6 in., and the range includes cupboard and drawer, waste box and sink assemblies. In addition to these there are drying cupboard, refrigerator and incubator units, and also sectionalised storage cupboards and a complete range of bottle shelves, storage racks, desks and ancillary equipment. The carcases are made from hardwood and veneered blockboard and exteriors are of oak, light polished with flush fitting handles to both drawers and doors. Toe-space rails are of mahogany.

Working tops are made from Moulmein teak, Iroko, asbestolite, chemical lead, black technoplate (toughened glass), formica, P.V.C. or polythene.

Fume cupboards in the "500" range vary from the simple hood to the most comprehensively equipped multiple assembly. They are framed from oak, teak or mahogany and lined with asbestolite with technoplate or asbestolite bases.

A comprehensive selection of newly designed service taps and sinks, together with polythene, vulcanite and stoneware waste fittings, gas generating, air and vacuum plant, are all available from the company.



Six basic applications of the "500" range of wooden laboratory furniture made by A. Gallenkamp and Co., Ltd. The different arrangements are explained on the opposite page under "wood furniture."

Metal

Although the traditional material for laboratory furniture is wood, metal laboratory furniture, while competitive in price, has advantages in the simplification of laboratory planning, ease of installation and flexibility of use arising from the unit construction. For overseas markets, particularly where there is little skilled labour for erection and where the climate is unsuitable for furniture constructed in timber, metal furniture is usually preferable.

Baird and Tatlock (London), Ltd., manufacture furniture and fittings in metal or timber, with all auxiliary fittings and service lines.

B.T.L. metal unit laboratory furniture is based on the use of cantilever-form steel bench standards to carry the bench top and services, providing a rigid working surface whether or not underbench units are fitted. Underbench units, selected as required from the standard B.T.L. range, are placed under the bench top in the desired position and locked in place by a simple levelling device incorporated in the unit. Units can be located without reference to the positions of bench standards and can be rearranged as desired. Services can be built up from B.T.L. prefabricated plumbing units. The company point out that an advantage of this system of unit construction for laboratories overseas is that the units, bench standards and accessories can be exported from this country and, if suitable local timber and labour are available, such timber accessories as bench tops can be made locally.

B.T.L. convertible laboratory equipment carries the flexibility of the B.T.L. metal unit system to an even higher degree. The basic component of the equipment is the service unit, carrying a wide range of services. To this unit are fitted removable working bench tops, adjustable from standing to sitting heights, and in a range of standard widths and materials. Compound under-bench units, developed from B.T.L. metal laboratory units, are so designed that they can be used at either standing or sitting heights, and a similar range of compound units is available in timber.

Decorative laminates

In recent years decorative laminates have been used as a constructional material in many laboratories. True phenolic laminates are solid homogenous boards, built up of several layers of resin impregnated core sheets, a coloured pattern sheet, and over all, an impregnated sheet, which becomes transparent during the curing process by which the various layers are fused by heat and high pressure into one. It is the particular resins used in this top sheet which give to laminates such as Formica, their resistance to abrasion, and which combine with the sturdy core to produce a very high impact strength. The company claim that little short of a really heavy blow or extreme abrasive wear will affect their surfaces.

Unlike most other known materials, say the makers, decorative laminates do not deteriorate with age (in fact, owing to the gradual curing of the resins they actually improve) and unless they are subjected to violent abuse they will show no mark at all. They will not fade, chip, crack or craze.

Decorative laminates are easy to keep clean. Spilt liquid, chemicals, grease and dirt can in most cases be removed from their surfaces with a damp cloth and some warm water. The makers of Formica claim that their material is chemically inert and completely non-porous. It is unaffected by such widely different chemicals as ethyl alcohol, carbon disulphide, chloroform and carbolic acid (10% and 5%). Alkalis and most acids in normal or strong solution will not harm it, and although a few of the mineral acids such as sulphuric or hydrofluoric will in concentrations attack it, no damage will be done if they are wiped off fairly quickly. It is claimed that Formica will withstand directly applied temperatures up to 310°F. and will not support combustion. Laminates, however, are in general poor conductors of electricity and should be used with caution where there is a risk from static charges.

They are stated to be excellent materials for wall panelling in corridors, dispensaries and laboratories for bench tops and fronts and work tables. They are available in a very wide range of colours and finishes—plain colours, linen finishes and woodgrains, to name but a few—and their bright clean appearance has an important psychological value.

A recent introduction is the "post-forming" grade of Formica material. This is a $\frac{1}{16}$ in. veneer identical in appearance and properties to the standard grade of Formica, but can be formed to $1\frac{1}{2}$ in. radius curves by pressing, after it has been evenly heated to 325°F. Although more versatile than the standard grade, this laminate is reported to be as tough and durable, will withstand the same knocks and hard wear and possesses a similar high degree of chemical resistance.

B.T.L. metal unit furniture installed in the main sterile products laboratory of the Group Pharmaceutical Unit, St. James's Hospital, Leeds.

Ovens and Incubators

A new range of ovens (to British Standard 2648) and incubators is being supplied by A. Gallenkamp and Co., Ltd.

The temperature range of the ovens is up to 200°C., which is reached within 65 min. from room temperature. At 100°C. the temperature variation between any two points in the working space does not exceed ±2·5°C., while the fluctuation at any single point is not more than 0·25°C. The incubators are designed to have a maximum working temperature of 100°C.

In order to satisfy these exacting standards, the firm has designed a hydraulic thermostat which is incorporated in this range of ovens and incubators. Known as the *Compenstat*, this device gives very accurate temperature control together with automatic compensation for changes in ambient temperature. It consists of a sensing bulb connected by a capillary tube to bellows in the control head. These operate a snap-action microswitch in the heater circuit. The snap-action prevents arcing and gives a contact life exceeding 300,000 operations, so that the thermostat setting is not upset by contact wear, and there is negligible interference with other appliances. Extra sensitivity is achieved by a small auxiliary heater wound around the capillary tube in the control space and connected in series with the main heaters. The auxiliary heater shortens the cycle of operation, and this limits temperature fluctuation and overshoot.

Automatic compensation for changes in control-head temperature (which the makers say is the best practical approximation to ambient temperature) is achieved by a separate bellows system. Temperature is similarly unaffected by changes in atmospheric pressure. No relay is required in the control circuit, and one possible source of breakdown is thus eliminated.

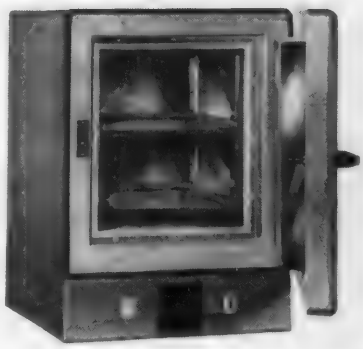
Both the ovens and incubators are made in three sizes, and the ovens may be obtained with or without mechanical convection. The liner, door box, shelves and supports are made in a smooth finish stainless steel.

Wide range oven

The Baird and Tatlock wide range oven, with fan, besides achieving the performance required by B.S. 2648, can, it is stated, be used over a range of 30°C. to 200°C. both for static

operation (with or without convected air flow) and for normal circulating or forced draught conditions with the fan operating. The oven is also available without a fan. The air vent can be adjusted from no flow to full-bore venting, when an air change of over 1,500 litres/hr. is possible; vent conditions are accurately reproducible.

The four identical heaters are connected in pairs, forming two heater circuits which are arranged to operate at different temperatures; this temperature differential is normally preset to about 15°C., but may be adjusted if, for example, it is necessary to run the oven at the bottom of its range. With this arrangement both heater circuits come into operation when the chamber temperature drops appreciably below the required temperature, giving rapid warm-up from ambient and rapid recovery after the oven door has been opened, but the auxiliary heater circuit cuts out at 15°C. below the required chamber temperature, thus minimising overshoot. Pilot lights indicate the operation of the heater circuits.



Laboratory oven made by A. Gallenkamp and Co., Ltd., incorporating the Compenstat hydraulic thermostat. The oven is finished in grey duotone enamel; all interior fittings are of stainless steel.

Special care has been devoted to the insulation of the heater box containing the heaters and the stainless steel chamber. In addition, the oven is fitted with a doubly insulated door with a stainless steel door back which seals in the chamber by means of an interwoven asbestos gasket.

Apparatus and Equipment

The common Kjeldahl procedure in the food industry for the determination of nitrogen content in the field of naturally occurring compounds is covered by the latest range of *Quickfit* apparatus, made by Quickfit and Quartz, Ltd., which includes equipment for semi-micro and macro Kjeldahl determinations.

Absorption traps are new additions to the *Quickfit* range of apparatus. They are intended principally for dealing with the fumes coming off during the digestion stage of Kjeldahl determinations, and they provide a compact and simple alternative to the use of a fume cupboard or duct.

A macro Kjeldahl distillation unit is available which uses ground glass joint connections, which are ideal for routine determination. The assembly uses the same flask for distillation as for the digestion stage, and conversion from one stage to the other can be done very quickly. All the distillation equipment, except for the flask, is carried on one straight rod by means of special spring clips and can easily be moved into position merely by adjusting one boss-head. This clamping system applies equally well whether the apparatus be one of a battery or a single unit attached to an ordinary retort stand. The dropping funnel is of the interchangeable plug design similar to that already standardised on semi-micro apparatus.

For many routine estimations it is convenient to use semi-micro quantities to speed up the work, and for a large variety of purposes it is often necessary to use either a vacuum jacketed or steam jacketed distillation flask.

A simple and compact apparatus is now available in which steam generated separately is passed into the distillation flask direct. Once again the same flask is used for both digestion and distillation. Distillation is usually considered to be completed within 15 min.

Quickfit modification to the well-known Soxhlet extractor ensures completely reliable operation. It uses a concentric tube siphoning device, and a range of Soxhlet extractors from 40 ml. nominal capacity to 600 ml. nominal capacity are available as standard items.

Among other important recent additions to the range of apparatus made by Quickfit and Quartz, Ltd., are the open-necked reaction vessels. The range covers capacities between 700 ml. and 20 litres, and the flasks carry a 4 in. flat flange neck. These are ideal for many applications where large stirrers are required, or when it is advantageous to clean a flask mechanically by putting one's hand inside through the large neck.

Glassware washer

The Dawson Laboratory glassware washing machine washes all kinds and shapes of laboratory glassware. The soiled containers are given a 3 min. jetted detergent wash (145°F. to 160°F.) followed by a 15 sec. jetted cold water rinse, but treatment times can be varied to suit individual conditions. These jets are so arranged that every part, inside and outside, of every piece of glassware is thoroughly cleaned.

The detergent in the machine is recirculated during the washing operation by means of a motorised pump. It returns to the tank and is pumped back through the jets via a pipeline filter, which prevents the jets from clogging and ensures that the detergent is always clean. The rinse water comes straight from the mains.

Operation is simple. The soiled glassware is placed in a special rack, the rack is inserted into the treatment chamber on guide rails and the counter-balanced door is lowered. The guide rails ensure that the articles are accurately aligned over and under the jets.

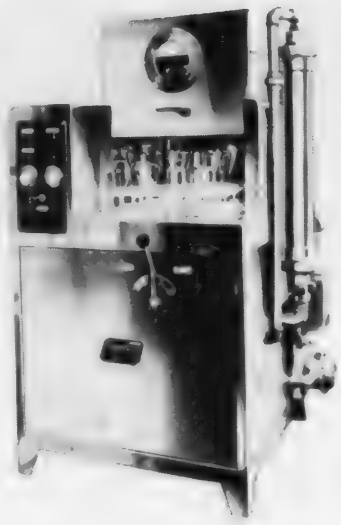
With the control lever in the wash position the starter button for the wash is depressed. An indicator light which glows for the duration of wash goes out when the wash is automatically switched off after 3 min. The rinse is controlled in the same way. The lever

is moved to the rinse position and the rinse button pressed. At the end of 15 sec. the rinse ceases, the light goes out and the glassware is ready to be removed.

The wash water can be heated by gas, steam or electricity. A stainless steel finish facilitates cleaning and helps to ensure hygiene. The counter-balanced door is fitted with a window, and a light illuminating the interior enables the cleaning process to be witnessed.

Polythene flasks

Rediweld, Ltd., are now offering two sizes of *Synert* polythene flask (500 ml. and 1,000 ml. capacity) of the conical (Erlenmeyer) type. The flasks are moulded from low-pressure, high-density polythene and can be used for operations involving temperatures up to 95°C.



Laboratory glassware is washed in just over 3 minutes in this machine made by Dawson Bros.

Reducing and Grading

No analytical technique is more accurate than the sampling technique which precedes it, and the reduction of samples to a homogeneous state is an important part of all laboratory work. One of the range of *Pulmac* mills, made by Follsain-Wycliffe Foundries, Ltd., has been developed especially for laboratory use, and is ideal for grinding small quantities of material. The mill is vibrationless, and can be mounted on an ordinary bench with a drawer or bag underneath.

The material is fed into the top hopper mounted on the cast iron casing and then falls on to an oscillating feed tray through an opening, the size of which is controlled by rotating a knurled knob. From here it falls into the door hopper which is suitably baffled to prevent back draught and thence it passes through a central orifice in the door into the mill. Surrounding the orifice is a stator with serrated rings between which runs the rotor mounted on a central shaft running in substantial ball or roller bearings.

The material is then subjected to a combined shearing, beating, crushing and grinding action by the high-speed impact of the lugs on the rotor beating it against the serrated rings on the stator, the major portion of the reduction being carried out by shearing action near the central orifice, resulting in a saving of power, the hardest work being performed near the shaft and not at the periphery. The angle and spacing of the lugs on the rotor are important factors in bringing this about. Three alternative designs of rotor and stator are supplied according to material to be ground.

Centrifugal force, assisted by the air induced into the mill by the high speed of the revolving rotors, draws the material to the periphery, where it is ejected through holes in a perforated screen.

Sturtevant Engineering Co., Ltd., manufacture laboratory machinery for reducing and grading of almost every material.

A ball mill which can run on 1 h.p. grinds hard materials such as ores, chemicals and fireclay. For a reasonable output the mill will reduce 2 in. lumps down to 30 or 40 mesh in one operation without auxiliary machinery, as it is entirely self-contained and effects its own screening. No special foundations are required. The grinding plates are of hard steel and the balls of special carbon steel. The screens can be easily removed and choking of the mill is prevented by an automatic device controlling the feed. Side and end plates are hinged to give easy access to the interior.

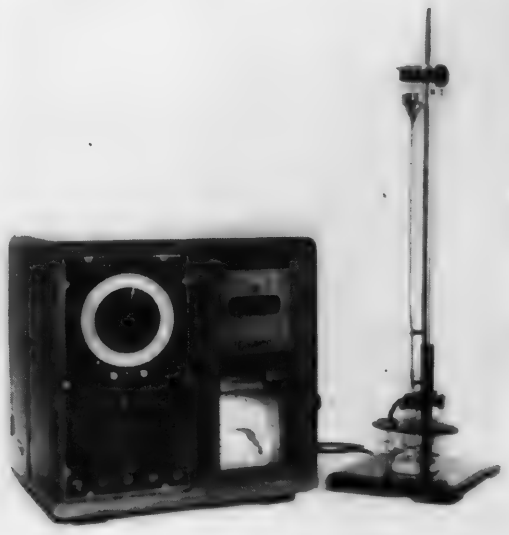
Materials such as gum arabic, sulphate of ammonia and soap flakes are dealt with by the hammer mill. It will reduce all but the very hardest substances from approximately 3 in. cube to 20 mesh and finer according to the friability of the material. Hammers swinging freely on pins are held out by centrifugal force and crush the material until it is fine enough to pass through the grate bars at the bottom of the casing. Should any unbreakable objects get into the mill the hammers being pivoted swing back, pass over the obstruction and fly out again.

The Sturtevant Unicam mill is a self-contained unit complete with a separating system operating on a closed circuit which is under suction, so preventing any leakage of dust. It is reported to be able to reduce most soft or medium hard material to a micron size without the use of an external source of energy such as steam or compressed air, or the need for screens at any stage of the operation. The air separator system allows exact regulation to a predetermined size of the finished product. The coarse product may be delivered externally from the separator instead of returning to the mill, so that two products of different size are obtained at the same time.

High vacuum unit

Among the wide range of equipment made by J. W. Towers and Co., Ltd., is a high vacuum pumping unit. Designed to meet most of the general high vacuum requirements, the unit readily achieves a vacuum of 10^{-6} mm. of mercury when used with a satisfactory backing pump. In it is incorporated a quartz 3-stage mercury vapour diffusion pump of robust design, a short-form double McLeod gauge, 2 traps conveniently arranged for cooling with

Left: **The Marconi fluoroscopic and radiographic cabinet, which can be used for the detection of foreign matter in foods.**



Right: **Evershed and Vignoles have designed the Tinsley polarograph with additional refinements on the basic circuit to simplify operation.**

solid CO_2 or liquid air, a drying vessel to be packed with P_2O_5 or silica gel for safeguarding the forepump, a simple differential manometer, and the necessary high-vacuum stopcocks.

The unit is of all-glass construction, and standard ground joints are used throughout. High pumping speed is assured by the use of wide bore Pyrex tubing, which also has adequate mechanical strength.

The whole unit is mounted on an aluminium alloy framework bolted to a heavy hard-asbestos baseboard. A backing pump giving a vacuum of 1 mm. of mercury or better is required for use with the unit, a suitable model being the Towers 1SP30B rotary pump. This will produce a vacuum of 0·02 mm., which is of course sufficient in itself for most laboratory purposes. The pump is supplied complete with a $\frac{1}{4}$ h.p. motor.

Another piece of equipment made by Towers which has attracted considerable interest in food research laboratories is the countercurrent apparatus. This is used for the extraction and purification of organic materials by a technique of countercurrent distribution between 2 liquid phases. Semi- and fully-automatic models are available.

Instruments

Instruments are finding increasing application in food laboratories. Polarimeters, polarographs, *p*H meters, spectrophotometers, absorptiometers, potentiometers, etc., all have their uses in increasing the accuracy and, in many cases, decreasing the tedium, of laboratory work. We describe below a selection of instruments of this type.

Polarimeters

Ericsson Telephones, Ltd., manufacture the automatic polarimeter type 143A, which is based on an original design by the National Physical Laboratory. It is an electronically controlled instrument the output from which can be fed into a recording device. It has particularly wide applications in industries where a large number of routine measurements are made daily. Because it is more sensitive than visual polarimeters, much shorter sample cell lengths can be used without sacrificing relative precision.

The use of short sample cells permits the measurement of solutions which can only with difficulty be measured in visually balanced polarimeters owing to absorption. This is because in any solution the angular rotation falls linearly with decreasing path length, whereas the absorption will usually fall exponentially. The basic range of the instrument is $\pm 0{\cdot}5^\circ$ of angular rotation with an ultimate precision of the order of $\pm 0{\cdot}0002^\circ$. By suitably off-setting the zero, the instrument can examine angular rotations within its range of $\pm 0{\cdot}5^\circ$ anywhere in the range $0—360^\circ$.

It operates on the Faraday effect, which is the rotation of the plane of polarisation of a beam passing through a transparent material in a solenoid. The rotation so produced is directly proportional to the magnetic field, and hence to the current in the solenoid.

The automatic polarimeter makes use of two such solenoids, a modulator and a compensator Faraday cell. The modulator is arranged to oscillate the plane of polarisation of a beam through a small angle at a frequency f. In the absence of a sample, and with the polarisers crossed, the intensity of the beam, which is sensed by a photo-multiplier, will not contain components at a frequency f, but of $2f$.

If, however, a sample is present, the intensity of the beam will vary, containing frequency components at both f and $2f$. The photo-mul-

tiplier output, proportional to the intensity of the beam, is amplified and frequency components differing from f are suppressed. Components at f are then detected in synchronism with the current at f in the modulator Faraday cell, and fed back as a direct current to the compensator Faraday cell.

The compensator Faraday cell is thus energised with a current automatically adjusted to compensate for optical rotations of the sample. This current, suitably displayed, corresponds to the rotation produced by the sample.

Polarographs

Polarography is essentially simple. It consists in making a suitable solution of the material to be analysed, and electrolysing it between two mercury electrodes. The anode is a pool of mercury and the cathode a series of mercury drops which emerge from a capillary dipping into the solution. A continuously increasing negative potential is applied to the cathode, and the change in current with voltage is noted; the rise in current at a particular voltage being the measure of the concentration of the species, and the voltage indicating the nature of ion or radical being determined. Such a current/voltage graph is called a polarogram, and the rise in current a polarographic step.

In the food laboratory, the polarograph can be used for detecting traces of metals and certain other impurities in foods, and with the statutory regulations now governing the metallic content of foods this is a highly important application.

Evershed and Vignoles have designed the Tinsley polarograph with additional refinements on the basic circuit for ease of operation. The small current from the cell is amplified and fed to a pen recorder or indicator, ancillary circuits cancel out extraneous currents due to minute traces of impurities in the chemicals used in the analysis, zero adjustment is provided which enables determinations of elements present in the ratio of 50:1 to be made on the same solution simultaneously. The motor-driven potentiometer is fitted with a two-speed gear box so that adjacent steps may be more easily resolved, and to allow for slow reactions such as occur in some biological applications. As it may not always be possible to measure two steps which are in close proximity, a simple switch change over enables the operator to obtain the first derivative of the normal polarogram, this has two effective time constants so that steps which are within 40 mv. of each other may be resolved.

Five degrees of damping are available, so that the pen or indicator needle excursions may be minimised for rapid routine analysis. However, a position of zero damping is provided in which the true current occurring during the life of each individual drop can be measured. This is required sometimes when the instrument is used in the investigation of electrokinetic processes. The complete instruments are housed in tropicalised wooden cases, which are claimed to be unaffected by industrial laboratory atmospheres.

The polarograph is also made by Cambridge Instrument Co., Ltd., and uses small individual charts. Where even greater sensitivity is required, the Cambridge *Univector* attachment is available as an accessory. With this, impurities can be measured with, in some cases, up to 20 times the sensitivity.

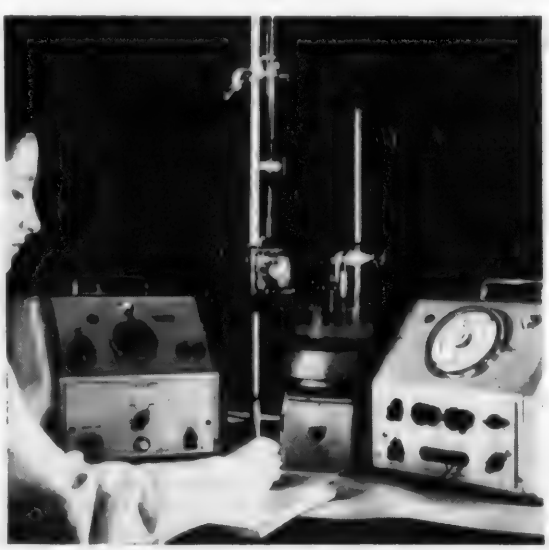
The Cambridge Instrument Co. plan to bring polarographic analysis within the budget of the smallest laboratory with a general-purpose polarograph which has undergone rigorous tests in the prototype stage. It is designed to work with indicators or recorders already available in the laboratory.

An article dealing more fully with the use of the polarograph in food analysis will appear in a forthcoming issue of FOOD MANUFACTURE.

pH Meters

Cambridge Instrument Co., Ltd., also make a range of *p*H meters. At present they market three such instruments, and hope to have a fourth (the Cambridge

Top left: **The Cambridge *p*H indicator is portable and can be used by junior staff.**



Right: **An automatic titration in progress featuring the Pye automatic titrator and the master *p*H meter.**

Pocket *p*H meter) on the market soon. All are suitable for accurate analyses, and one, the *Direct Reading* *p*H meter, is especially suitable for rapid routine measurements by junior staff.

The Cambridge *Bench Pattern* *p*H meter is the analyst's standard instrument. Enclosed in a teak case, it is robust and of the highest accuracy (to ±0·01 *p*H). Measurements are made by adjusting a potentiometer until the bridge circuit is balanced and then reading off the values indicated by the potentiometer adjustment dials.

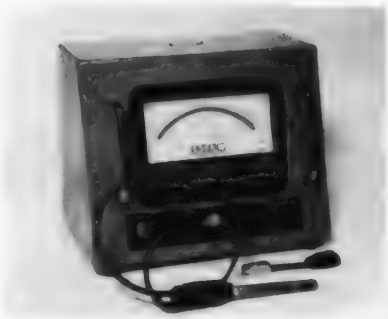
The Cambridge *Portable Pattern* *p*H meter is similar to the Bench Pattern in most respects, but has additional compartments for the storage of electrodes and accessories. An instrument for the analyst who has to make his tests on site.

The Cambridge *Direct-reading* *p*H indicator has the advantage of pointer indication on a scale calibrated directly in *p*H units. Although having an accuracy somewhat less than the other two meters, the direct-reading type has great stability and is used by junior or unskilled staff.

A large number of electrodes for special purposes is available, as well as the usual glass, calomel, "alki," wide-range, and other types.

Automatic titrator

Although the fully automatic laboratory is some way off, the use of the Pye automatic titrator in combination with a direct-reading *p*H meter/millivoltmeter is claimed to offer automation where routine titrations are involved. In the illustration the *p*H measuring electrode system feeds the *p*H meter (right) which at all times indicates the *p*H value. This in turn drives the automatic titrator (left) previously set up so that it shuts off the flow of reagent from the burette by means of the delivery unit. In order to add the majority of the burette solution at the maximum rate, an additional circuit in the titrator switches from fast to slow rate of addition at a predetermined distance from the end-point.



Checks on industrial humidity controllers can be made by electronic hygrometers such as this one made by the Shaw group.

This combination can be used to maintain solution *p*H at any given value (*e.g.*, while a reaction proceeds) and can be employed whenever samples have to be adjusted to a certain *p*H value.

Potentiometric microtitration apparatus

For the determination of chlorides in plasma, serum, cerebrospinal fluid, etc., and other titrations, this apparatus was designed by Gallenkamp and Co., Ltd., in co-operation with Dr. I. D. P. Wootton, Postgraduate Medical School of London.

With it the chloride content of as little as 5 ml. of solution may be determined. Titration is carried out against a standard silver nitrate solution, and the method is particularly suitable for use with blood plasma, serum, cerebrospinal fluid, etc., where only small volumes of sample may be available.

The silver-platinum electrode system is built into the jet of a short 5 ml. burette, and the contents of the 10 ml. beaker, in which titration is carried out, are stirred magnetically. The end point of the titration is indicated by a valve millivoltmeter which incorporates a suspension type galvanometer for absolute accuracy. The electronic circuit of this meter is fully stabilised and the galvanometer has a very short period and is of rugged design.

In operation, with periodic checks of the end point made against a standard chloride solution, it is only necessary to run in titrant to a predetermined reading of the galvanometer, at which point titration is complete.

Hygrometer

The Shaw electronic hygrometer is said to have an immediate response, stable characteristics and provision for easy checking and standardising, as well as remote reading.

The small detecting element consists of a capacitor with a hygroscopic dielectric, only a few microns thick, with a 24 carat gold electrode. A detector is contained in a small, fine wire gauze protector, which plugs into a coaxial cable connecting it to the recorder. The detecting element is 1 cm. in diameter and 6 cm. long, and can be used with any length of cable.

These hygrometers have been used as standard instruments by which checks are made on industrial relative humidity controllers, such as are fitted in many factories.

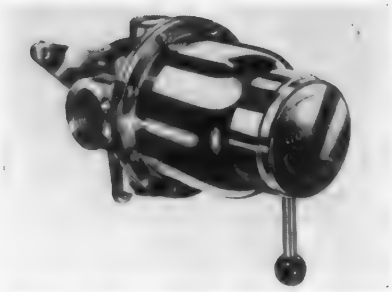
Another use is for quick estimation of moisture in hygroscopic materials. The detector is simply placed in the material to be tested, and after a few seconds, when the pointer is steady, the moving coil meter indicates the moisture of the material on the easily read scale.

Photo-electric instrument

The *Eel* titrator, which has just been introduced by Evans Electroselenium, Ltd., meets the demand for an instrument which will operate on colour rather than *p*H change following the increased use of complexones for titration.

This instrument has been thoroughly tested in agricultural, medical and research laboratories, and the manufacturers claim that it can be fully recommended for determinations of calcium, fluorides, barium, sulphates and combined calcium-magnesium, and that many other determinations can be carried out, since any titration involving colour change employs the same principles.

In operating the titrator, a known volume of sample is placed in a beaker with a buffer solution and to it is added a small amount of indicator. The magnetic stirrer is then switched on to ensure a



Leonard thermostatic steam and water mixer.

thorough mixing of solutions, which now become coloured. Measured quantities of reagent are then added from a burette with continued stirring, each addition causing a change in colour which, in turn, gives a different reading on the galvanometer scale.

If the procedure is continued, a stage is reached when the addition of reagent results in a much greater change in galvanometer readings. The point at which the largest change in reading occurs indicates the end-point.

This instrument does not command the time of a skilled operator and will provide results independent of the vagaries of the human eye.

Refractometers

Several types of refractometer are made by Bellingham and Stanley, Ltd. In their Abbe refractometer the refractive index scale is on glass, and is read by transmitted light. This leads to greater convenience in taking measurements, and is said to allow a higher degree of accuracy to be achieved. An additional scale for sugar solutions, fruit pulp, etc., reading directly the percentage of soluble solids, can be engraved if required. The eye-piece of the scale magnifier and of the telescope are fixed at average eye-distance apart, so that the border line and divided scale can be viewed simultaneously. A polarising eye-piece, together with an enclosed lamp providing back illumination, enables the standard refractometer to be used for investigating the properties of doubly refracting fats and other substances.

A sugar and oil refractometer, giving readings between 50% and 81% soluble solids, is also available from the same firm. Transmitted light can be used for transparent solutions and reflected light for dark or opaque substances. The prism face is horizontal, so that the sample cannot drain away.

Other refractometers made by Bellingham and Stanley include an immersion refractometer, for which an auxiliary prism is supplied to enable the instrument to be used with dark liquids, and a projection refractometer for use with viscous, dark coloured, transparent or translucent materials. With this latter instrument, neither prism box nor thin film are required—the material is simply applied to a horizontal glass surface. Readings are visible on a large open scale without magnification, and can be seen at a glance.

A series of pocket refractometers covering ranges of soluble solids from 0% to 85% is also available.

Polarimeters are also made by Bellingham and Stanley, Ltd. Their Model D is designed especially for testing sugar solutions and similar optically active liquids. It can be supplied with an improved optical system in which the half-shadow system is in front, at the circle end of the instrument, which allows a permanent focus to be maintained. Definition is also improved, and the half-shadow system revolves with the circle, giving immediate indication of the direction of rotation of the material being examined. Provision can also be made for attaching the lamp to the instrument, giving correct alignment at all times.

Fluoroscopic and radiographic cabinet

A unit providing for the direct visual inspection of articles by X-ray fluoroscopy is now made by Marconi Instruments, Ltd. It can be used for the detection of metals, glass or other foreign bodies in foods. The unit contains an inspection drawer, immediately above which is a cassette drawer which can be used for the radiography of extra-dense articles. The inspection drawer has a base of low X-ray absorption Perspex,

The Elgestat Multiplan laboratory deionisation unit set up for operation.

and the X-ray image of the article examined is projected on to a fluorescent screen. The strength of emission is adjusted to the density of the particular article to be examined, and any impurities of greater density are then immediately seen on the screen. Facilities for the removal of the tube-head allow for the inspection of articles too large to fit into the drawer.

Marconi Instruments, Ltd., also manufacture a portable moisture meter, designed for the rapid and accurate estimation of moisture in a variety of materials, particularly those of organic origin. The material to be tested is compressed in a test cell provided with the instrument, and it is claimed that moisture content can be measured to within 0·5% in a few seconds. Calibration charts are available for more than 300 substances, including cereal grains and many other food materials.

Thermostatic mixing valves

Supplies of hot water of any required temperature, constant to within a few degrees, can be obtained by the use of the thermostatic mixing valves manufactured by Walker, Crosweller and Co., Ltd. Units are available for mixing hot and cold water and steam and cold water. The valves are simple in operation. According to the temperature of the water in the mixing chamber, a bimetallic coil winds or unwinds, and in so doing opens or closes the ports in the valve admitting hot and cold water or steam and cold water.

The traditional method of freeing water from small amounts of mineral impurities is of course distillation. Several firms have recently developed equipment for demineralising water by ion-exchange treatment, however, and laboratory-sized units are available from several sources. These units need neither heat nor power, and are said to produce demineralised water at a fraction of the cost of distillation.

Portable demineralising plants

Two portable models, both of which are suitable for laboratory use, are now available of the *Deminrolit* plant, made by the Permutit Co., Ltd. In these units, granular ion-exchange resins are contained in a pair of small sealed cylinders through which the water is directed in series by a multi-valve control. The first cylinder contains "Zeo-karb" hydrogen ion exchange material, which replaces cations in the water by hydrogen ions; the salts in the water are thus converted to the corresponding acids. This acid water then passes through the "De-acidite" material contained in the second cylinder; the acids are thereby absorbed, and treated water is produced which contains only minute traces of the salts originally present in the raw supply.

The Loughborough water deioniser consists simply of a plastics covered metal cartridge with a polythene base.

After the rated output of water has been demineralised, the ion exchange materials require regeneration. This is done by flushing the "Zeo-karb" cylinder with dilute hydrochloric acid and the "De-acidite" with sodium carbonate or caustic soda; the *Deminrolit* plant is then ready for producing another batch of demineralised water.

Output per regeneratian varies approximately in inverse proportion to the quantity of soluble salts present in the raw water. When treating "thin" waters—*i.e.*, those containing only a small quantity of dissolved solids, a greater output per regeneration is thus obtained than with water more heavily charged with dissolved solids. To show when regeneration is required, an electrical conductivity tester is provided. The electrical conductivity of water varies with the dissolved solids present. A measure of the conductivity thus gives a reliable indication of the amount of solids which the water contains.

Portable *Deminrolits* are made in two sizes, Mark IV and Mark V.

Laboratory deioniser

The Loughborough water deioniser has been designed specifically for general laboratory use. It is a compact and easily operated unit consisting only of a plastic-covered metal cartridge which screws into a polythene base. The cartridge contains a mixed resin bed and has an unusual feature in foamed plastics pads, set at intervals along its length, to perform two important functions; being initially compressed they readily prevent air pockets forming as a result of resin shrinkage, and in addition, counteract any tendency to channelling. In the base a conductivity cell monitors the output and indicates when quality falls below 2·5 conductivity units. The flow is controlled by a special polythene tap, which operates against mains water pressure in all parts of the country.

Demineralised water is produced by Permutit's Mark V portable "Deminrolit" plant.

The setting of the conductivity cell ensures that, throughout the life of the cartridge, water superior to normal distilled water (as defined in B.P. 1953) is obtainable; in fact, say the company, the water is superior to conductivity water for most of the time. A typical analysis shows less than 1 p.p.m. of heavy metals, sodium, magnesium, calcium, silica, chloride, sulphate, ammonia or carbon dioxide.

The cartridge life varies with the mains water in use; from a hard water of 230 p.p.m. ionisable solids the output is about 50 gal. and then rises to 500 gal. in soft water areas.

Regeneration is carried out by Loughborough Glass Co. by an exchange cartridge service. By having a spare cartridge the deioniser can be kept constantly ready for use; the company arranges collection of exhausted cartridges for regeneration over most of the country.

No special knowledge is called for in assembly or operation of this unit.

(*Concluded on p.* 244)

Science and Sugar Confectionery

By A. G. Lipscomb,* B.Sc., Ph.D., F.R.I.C., F.I.S

The influence of science on the art of the sugar confectioner has already been considerable, and more and more manufacturers are now seeking the service of qualified technical staff. The scientist was not always a welcome addition to the factory personnel, however. In this article, Dr. Lipscomb looks back to times when the chemist was viewed with suspicion, if not with open hostility, and discusses some of the beneficial effects which science has none the less brought about in this industry.

BEFORE the First World War, the influence of science in the confectionery industry was not very great. The advice of the chemist—usually a consultant—was sought at times in connection with the suitability of a water supply, either for boiler feed or for use in processes, or with the establishment of the purity or otherwise of a raw material and as an expert witness in disputes about warranties, or in cases involving alleged breaches of the food laws. But the history of the serious application of scientific control and research in the confectionery trade covers little more than fifty years, only two of the major manufacturing firms having had their own chemists before the beginning of the present century.

Interest in the chemist and what he could contribute to industries other than those of a purely chemical nature began to grow during the 1914-18 war and was fostered in no small measure by the popular press, who publicised the important part that scientists were playing in the conduct of the war. As a result chemists were in great demand in the nineteen twenties particularly in the food industries, although there was frequently no clear idea of the proper function of the laboratory.

Early analytical approach

Many of the chemists who were appointed had received their training in the laboratories of public analysts and brought with them into industry the outlook of the public analyst, so that much attention was given to the detailed analysis of raw materials and finished goods. This was not a bad thing since it provided excellent laboratory tools for the use of the technologists and research men who joined them and as data were accumulated and trends assessed it became possible to reduce the volume of routine analytical control work, and to devote more time to the investigation of processes and to the improvement of keeping qualities and packaging methods.

Here the chemist found himself faced by the skilled craftsmen who had grown up in the industry and were in a very strong position. Fortunately there were many firms who realised that rule of thumb methods were out of date and that with increasing competition and costs it was necessary to take advantage of the powerful help that science could give to production, particularly if it were not hampered by trying to confine it by the four walls of the laboratory.

There were, of course, many difficulties and prejudices to be overcome—there was the fear on the part of the managers and foremen of the loss of authority and prestige and possibly even of their jobs, and at Board level there was the fear of the supposed impractical nature of the chemist, who, it was thought, might shut himself in his Ivory Tower and waste money in high-flown experiments of no commercial importance.

Development in the industry was undoubtedly delayed, particularly in the early days, by these prejudices. There were, of course, firms whose directors had vision and foresight, who realised that scientific research required time, and at the same time there were plenty of chemists who, by their tactful approach, could make friends with the so-called practical men and not only transmit their own ideas, but also learn from the skill and experience of the latter. As a result of this, mutual confidence has grown and, indeed, many of the departmental managers and foremen of today have received scientific training both in their own organisation and at local technical institutes where the City and Guilds course in confectionery is established. The original grudging acceptance of the chemist has today given place to a co-operation which is sometimes so enthusiastic as to be embarrassing, so that there is a tendency for the laboratory to be consulted on comparatively trivial matters by the factory staff, and for it to be asked by the management to undertake work outside its scope, so that the chief chemist is sometimes hard put to it to combat these tendencies to convert a research department into a service department.

As the years have gone by, the scientist in the confectionery industry has also developed from the original analytical chemist to a more all-round kind of technologist with a sound working knowledge of other sciences. Physics, for example, and its comparatively recently developed branch rheology, are of paramount importance to the confectionery technologist. He needs too a knowledge of biochemistry, microbiology and engineering, while familiarity with the application of statistical methods, not only in connection with laboratory work, but also in quality control and design of experiments in the factory, is of considerable value to him.

* *Chief Chemist, John Mackintosh and Sons, Ltd.*

A general view of the laboratory at John Mackintosh, Ltd.

Research Association

Alongside the growth of scientific work and control within the industry we have seen the development of a highly efficient co-operative research organisation. This was started immediately after World War I, under the rather clumsy title of the British Association of Research for the Chocolate, Sugar Confectionery and Jam Trades. The association was reconstituted in 1946 on a wider basis as the British Food Manufacturing Industries Research Association, with membership open to food manufacturers, processors, and preservers of any class or description.

The association has today a membership of over 400 firms. It is governed by a Council, the members of which are drawn from the different branches of the food industry in proportion to membership. Each section of the industry nominates a panel of technical representatives who meet annually to discuss the activities of the association, and each panel elects a small research committee which meets periodically with the director and other members of the staff to discuss the work in more detail. The staff of the association numbers 60, about half of them being qualified chemists.

The association is financed by subscriptions from member firms, and the Government, through the Department of Scientific and Industrial Research, makes a grant equal to about one half of the total subscribed by the members.

It might be thought that business firms would be reluctant to subscribe to a research association, the results of whose work might be of value to their competitors. This may have been true in the early days, but carries little weight today. It is interesting to note that the articles of association provide that any member who considers that his personal interests are likely to be prejudiced by any suggested research can appeal to the Department of Scientific and Industrial Research who may, if they consider the complaint to be justified, suspend or prohibit the research in question. As far as is known, this article has never been invoked. It has no doubt been realised that the work done by the Research Associations contributes to the overall efficiency of the industry of the country and improves its chances in overseas markets. The inefficient are indeed the curse of any industry, and the higher the average standard of the products of an industry, the better it is for all concerned in it.

Problems of sugar boiling

The author's earliest experience was in connection with sugar boiling and at that time there were no recognised methods for the analysis of boiled sweets, so that the first job was to develop or adapt and test suitable methods. These included methods for the estimation of water, sucrose, glucose (corn syrup) and invert sugar. Having developed suitable methods of analysis, one was in a position to control the work of the boiling department and to ascertain the causes of various defects which were known to develop in boiled sweets between manufacture and sale to the consumers. These included such things as massing and candying, and having found the causes of these defects it was a comparatively simple matter to eliminate or minimise them, although tact was required in overcoming the suspicion of the sugar boilers.

Various anomalies were met with and the causes had to be elucidated. Thus, it was found that over-inversion in a boiling in which cream of tartar was used as the inverting agent was not necessarily due to the carelessness on the part of the boiler, and it was he who gave the clue to the solution by his reference to "strong" and "weak" sugar. Two samples of white sugar might be indistinguishable as far as sucrose, invert sugar and moisture contents were concerned, but a solution of one might invert more easily than a solution of the other, and more colour would be produced in the process. By analysis of the constituents of the ashes of the two sugars, it was found that the inorganic constituents of the strong sugar exerted a greater buffing power than those of the weak sugar.

Graining and stickiness

While these analytical investigations were going on the physical properties of boiled sweets were also being studied. At that time the individual wrapping of sweets was almost unknown and they were packed either in well-stoppered glass jars or lever lid

tins. The hygroscopic nature of the goods was well known and it had already been established by rule of thumb methods that the sweets should be packed into the jars and hermetically sealed while they were still warm. Air-conditioning was, of course, practically unheard of.

It was recognised that boiled sweets were actually super-cooled liquids, and while the amount of "doctor" present was sufficient to prevent sucrose crystallisation during the boiling process, the formed and cooled sweets were obviously supersaturated with sucrose, and "graining" was only prevented by the lack of crystal nuclei and the very high viscosity of the material. The absorption of a small amount of moisture on the surface of the sweets was sufficient to reduce the surface viscosity to such an extent that the linear crystallisation velocity became sufficiently great for graining to take place. Once the process had begun dilution took place layerwise and graining continued until the whole sweet was candied.

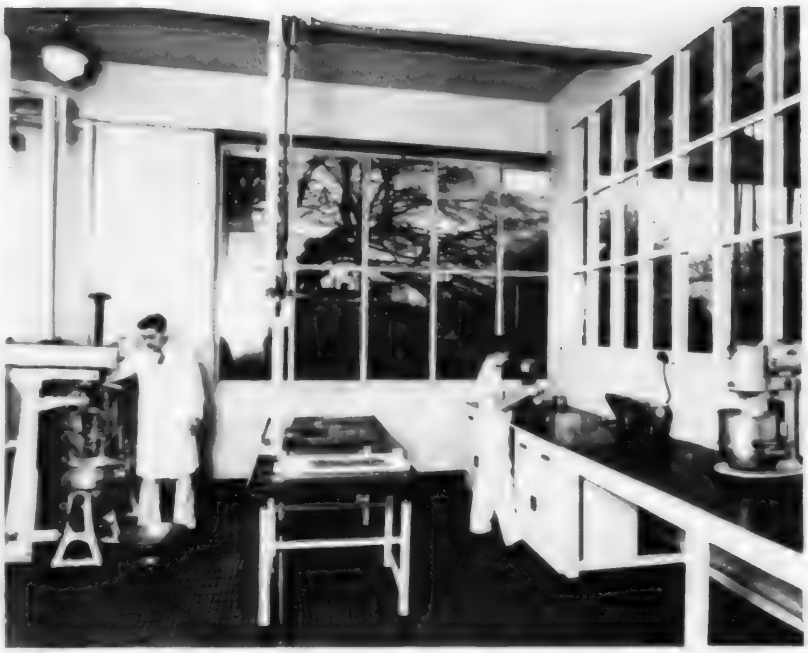
It was clear that the vapour pressure of boiled sweets was a physical content of the greatest importance to the confectionery industry, and it proved an early subject for study. A method of measuring it was developed and it was found that the vapour pressure of fresh boiled sweets is in the region of 7 mm. of mercury, varying to some extent, of course, with composition. Since the atmospheric vapour pressure in this country normally varies from 5-20 mm., moisture absorption will nearly always occur on exposed sweets. The B.F.M.I.R.A. has also carried out work on the vapour pressure of confectionery and a very useful paper was published by Dr. W. Grover on the subject.[1]

In the course of our work we found that over a wide range of concentrations (60-94%), the solids of corn syrup have a relative vapour pressure about 7% higher than that of invert sugar solids. In the case of boiled sweets containing, say, 25% of corn syrup solids on the one hand and 25% invert sugar solids on the other, and boiled to the same moisture content the difference in vapour pressure is, of course, less. For example:

	%	%
Sucrose	72	72
Glucose Solids	—	25
Invert ,,	25	—
Moisture	3	3
% R.V.P.	30·6	34·8

i.e., the corn syrup product has a relative v.p. 4-5% higher than that of the invert sugar product. This explains why boiled sweets containing invert sugar go sticky more readily than similar products containing corn syrup.

The above figures refer to room temperature (60°). As the temperature rises the absolute vapour pressure of the sweet increases; thus at 85°F. the v.p. is 10-11 mm. and at 100° it is 15-16 mm. The rate at which sweets absorb moisture from the air is a function of the difference between the v.p. of the air and that of the sweet. In a factory without air conditioning, with a room temperature of 68°F., on a bad day (R.H. 85%) the v.p. of the air will be approximately 10 mm. above that of the sweets, on an average day (70% R.H.) 7·5 mm. above, and on a good day (R.H. 60%) 5-6 mm. above. It follows from these figures that if the sweets are wrapped and packed while they are still at a temperature of 40°C. (104°F.) when their average vapour pressure is 15·5 mm. they will not absorb moisture even on a bad day.



The experimental laboratory at John Mackintosh, Ltd., in which facilities are available for pilot-scale experiments.

In practice sweets can be wrapped and packed on a good or average day without going sticky if their surface temperature is not less than 35°C. (95°F.). While it is uneconomical to condition the air of a boiled sweet factory to 30% R.H. (Dew Point 3°C.) it is, of course, quite feasible to produce a dew point of say 7-8°C., which would serve to convert a bad day into a very good day, and should give trouble-free wrapping and packing.

Packaging techniques

As previously mentioned, boiled sweets were formerly packed in glass jars without individual wrapping. Provided the goods were boiled sufficiently high (moisture content 2-3%), and were packed warm, the shelf life at normal temperature was good. But there were a number of hazards involved which greatly reduced the chances of the sweets reaching the public in good condition. Stick-

ing and massing, for example, could occur in two ways: (a) if the sweets were packed at too high a temperature or (b) were exposed to direct sunlight in a shop window. In such cases the shopkeeper was reduced to using a hammer and chisel to get the sweets out of the jar, with grave risk of having broken glass mixed with them.

Again, although the lids of the jars might fit well, there was the risk that the shopkeeper might be too lazy to replace them properly. Moist air would then enter the jar, the sweets become sticky and graining would occur quite quickly. Jars with screw tops and aluminium lids fitted with rubber washers were introduced, but these were subject to the same risks as the glass jars. The next development was the fitting of an absorbent pad in the top of the jar. The pads were placed in perforated aluminium cages attached to the inside of the lids. These pads were made of asbestos and after soaking with calcium chloride solution they were dried out. They served to keep down the relative humidity in the jars to a very low level. Although excellent in theory this type of pack failed in practice. Again the shopkeeper failed to close the lids properly—the calcium chloride then absorbed moisture so rapidly that the pad became saturated with brine which dripped on the sweets with regrettable results.

At about the same time transparent film began to interest packaging experts. Manufacturers were anxious to put out unit packs of boiled sweets and found these film bags very attractive, particularly as they had been told that the material was waterproof. It was pointed out that waterproof and moisture vapour proof are not synonymous, but in spite of the warning they carried on with the project. Needless to say moisture from the atmosphere readily penetrated the film bag, and the contents were quickly spoilt—in the extreme cases the sweets finished up in solution.

It is usual to wrap boiled sweets individually in moisture-proof film, and while the glass jar is still common, numerous unit packs have been developed which are more or less moisture proof. Heat-sealing, moisture-proof film bags of the double-walled type give good protection, and if the outer box is overall wrapped in heat-sealed, coated paper, the shelf life will be six months or more. Roll packs are also very popular, and these vary in protective properties with the nature of the wrapping materials used and the method of sealing.

With the introduction of individual wrapping, the massing or flowing together of boiled sweets is no longer a problem. A considerable amount of research work was however devoted to this subject in the 1920s. It was clear from the outset that the problem was a rheological one. The main facts that were established were (a) for a sweet of a given composition there is a sharp rise in viscosity as the moisture content decreases from 3% to 1% and (b) for a given sucrose and moisture content, a sweet containing invert sugar is less viscous than one containing corn syrup.

With the growth of knowledge, efforts were directed to the making of boiled sweets of the lowest possible moisture content, which led to a rapid increase in the development of vacuum boiling plant, and the employment of buffering agents to prevent the development of discoloration. It may be that these developments would have occurred had the old craftsmen been left to themselves, but there would have been many costly failures resulting from their hit and miss methods as compared with the scientific approach of the chemists in the industry.

Use of statistics

Any discussion of scientific developments in the confectionery industry would be incomplete without a reference to the growing use of statistical methods in quality control, in the assessment of the results of organoleptic tests, in the design of plant experiments and in the many other ways.

The proper sampling of raw materials is a problem which can be solved satisfactorily only by recourse to statistics. How many bags in a consignment must be sampled, and how shall they be chosen, systematically or at random? And having drawn a satisfactory sample, how many tests are required to give the desired degree of accuracy? These are questions which involve the statistical investigation of the nature and extent of the variations which exists in the material in question. It is often thought that a 10% sample is satisfactory, and while that may be true for some materials, for example white sugar, it is not true for very variable materials like cocoa beans.

Many laboratories make hundreds of routine tests per week and all too often they are recorded and forgotten except when something obviously abnormal is found. But if the records are regularly subjected to a statistical examination, much useful information can be obtained which will be of value in the investigation of things like quality variation. It is particularly useful to institute quality control charts in the factory wherever possible, and it is surprising how soon foremen come to rely on them.

The scientist in the confectionery industry spends a great deal of time in carrying out experiments to find the effects of variations in one process factor or another. It is a simple matter in the laboratory to keep all the factors under control and to vary them one at a time. When he comes to transfer his results to the factory, where he will find himself faced with inherently variable materials and variable process factors like steam pressure, beater speeds, the human element, and so on, he will be forced to have recourse to statistical principles in the design of his experiments. It is also often necessary to make production scale experiments to determine the cause or causes of defects in processes, and here again statistical technique helps with the design of the experiment and ensures maximum economy of time and materials in carrying out the test.

The above outline is necessarily brief, but sufficient has been said

to indicate the value of statistical methods to our industry. This subject cannot be left without a word of warning. A lot of time can be wasted and costly mistakes made by the attempts of the inexperienced to apply these methods. It is well to emphasize what statistics can and cannot do. It can extract the last ounce of information from masses of otherwise intractable data, but it cannot reveal anything which is not implicit therein. It is the mishandling of such methods which has given rise to the saying "lies, damned lies, and statistics."

Correlation, for example, must not be assumed to imply causation except on the basis of sound scientific evidence. A well known statistician once referred to the fact that the proportion of marriages in Britain contracted outside the church of England has for many years been increasing, while the average age at death has also been increasing, and there is a positive correlation; but no one supposes that there is a causal relationship and that marriage in a registry office would increase ones chances of becoming a centenarian.

Conclusions

To sum up, in the British Confectionery industry generally, as the years have passed the acceptance of the chemist and other scientific workers has grown steadily. At first he was regarded by some firms as rather a luxury, although he had his uses perhaps, as a buffer against the attacks of those responsible for enforcing the food legislation of the country. Then it came to be realised that he might also afford protection against unscrupulous suppliers of raw materials by exercising his analytical functions. The realisation of the even greater value of the contribution he could make by virtue of his research activities came more slowly and more unevenly but none the less surely.

What of the future? Today, the scientist responsible for the direction of research in a confectionery firm is faced by two problems, both of which hinder the work of his department. The first is the tendency for the laboratory to become a service department, so many are the calls for advice and practical help made upon its time by all sections of management. The second is the severe shortage of chemists and technologists, and this is aggravated by the serious competition for their services by other industries, particularly the newer ones.

The first problem can only be solved by careful organisation of the work of the department. The staffing problem is more difficult, but the abolition of National Service will make it easier to take boys leaving the grammar school into the laboratory for training, while at the same time they attend the local technical college for part-time education. This system worked well before the war and there seems no reason why it should not prove satisfactory in the future, in spite of the higher standards expected in professional examinations.

REFERENCE

1. W. Grover. *J. Soc. Chem. Ind.*, 1947, **66**, 201.

Laboratory Equipment

(*Concluded from p.* 239)

Ion exchange equipment

Several pieces of equipment for supplying demineralised water have been developed by Elga Products, Ltd. The first is the *Elgastat Multiplan* which is claimed to be a self-contained unit for the execution of all known ion exchange and de-ionisation processes. Essentially it comprises 2 plexiglass columns, one with interface for mixed bed regeneration *in situ*. Both columns are fitted with flow control valves and detachable filters.

An air pump is provided for the mixing of the anion and cation exchangers. Flow lines for the many operation and regeneration cycles are included. Quality control is by means of a conductivity cell and monitor. Chromatographic-grade resins are among the 9 ion exchange resins which are provided with the unit.

The *Elga Recirculator*, consisting of a sink unit with a built-in mixed bed exchange column, provides deionised water for the washing of slides and glassware. For economy the used water is not run to waste but is recirculated through the exchange columns. Flow rate is up to 50 gal. per hr.

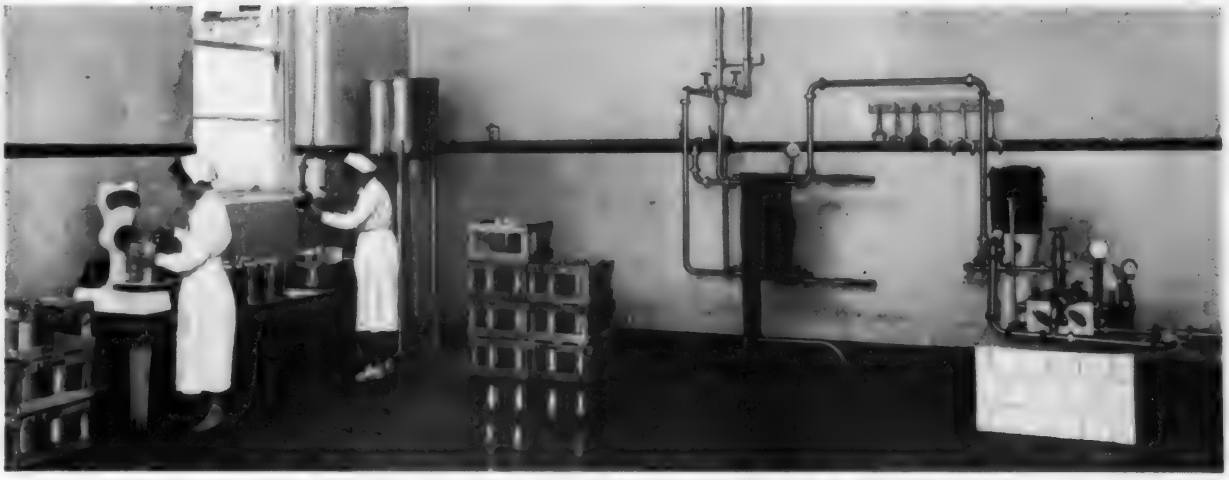
The firm has also produced a cold-still with a capacity of 20 gal. per hr. It is stated that water is provided at tap speed. The cold-still requires no regeneration *in situ*. A cartridge exchange service is provided.

Water stills

For those who prefer to obtain pure water by the more conventional method of distillation, a selection of stills is available from Manesty Machines, Ltd. These units range in size from small gas or electrically heated models giving 2 pt. per hr. to large steam-heated models with outputs of from 2 to 50 gal. per hr. Models giving 3 and 6 to 8 pt. per hr. are said by the makers to be very popular for laboratory use, and both of these can now be supplied in chrome and vitreous enamel finish.

The distilled water produced from the stills is above the British Pharmacopœia requirements, and the stills are entirely automatic in operation provided supplies of heat and raw water are constant. With electrically heated models, cut-outs are fitted to the heating elements to prevent trouble in the event of the water supply being interrupted. Several models are fitted with toughened glass lids, and a special feature of all the stills is the efficient baffle system, by which the direction of the water vapour is changed three times before condensation, in order to prevent entrainment. Stainless steel is used in the construction of the condensing tubes and other parts, the smaller *Destil* models having a monel metal tube.

▶A publication giving details of the auxiliary equipment for use with their *Dionic* water purity meters has been issued by Evershed and Vignoles, Ltd. The equipment includes a water cooler, steam condenser, and a de-gassing condenser, the working principles of which are described. Illustrations and sectional diagrams are included.



Frozen whole egg in production at the factory of S. J. McDowell at Ballymena, Northern Ireland.

The Elimination of Pathogens from Frozen Whole Egg–1

By C. L. Heller, N. R. Knowles and K. Bryce-Jones *

The dangers of frozen egg as a possible source of food poisoning have been worrying health authorities for some time. In this article the author discusses the bacteriology of frozen egg, and describes ways in which it can be made entirely safe for consumption.

IN recent years the problem of salmonella food poisoning and outbreaks of paratyphoid fever have received special attention from public health authorities. Outbreaks have frequently been associated with the consumption of imitation cream, although the mode of contamination has been obscure until recently. Investigations into outbreaks of paratyphoid fever in 1955 showed that Chinese frozen eggs served to introduce the causative organism into bakeries, and subsequent examination of frozen egg from China has shown that this commodity has occasionally been infected with *Salm. paratyphi B* and relatively often with other salmonellæ. The Report of the Ministry of Health for 1955[1] also points out that *Salm. thompson* has for a long time been the third commonest cause of food poisoning in England and Wales and that the source of this organism has always been a mystery. Consequently the finding of *Salm. thompson* in Chinese frozen egg and in frozen egg from other countries has been important epidemiologically.

Almost all British bakery products in which egg is used receive a heat treatment which is sufficient to destroy any salmonellæ that may have been present in the egg,[2, 3] but equipment with which infected egg comes into contact will become contaminated and such equipment may, in turn, contaminate products such as imitation cream which do not get baked.

This problem is unlikely to be solved by the direct use of shell eggs, which would be more expensive and still involve a commensurate small element of risk. Nor is the use of dried egg regarded as a satisfactory alternative, since this product is also likely to contain salmonellæ, unless pasteurised at some stage in its manufacture; furthermore, in spite of technical improvements, dried egg is not generally regarded in this country as being a satisfactory substitute for frozen egg for all purposes.

In recent years, increasing knowledge has been gained of the successful practice of pasteurisation of egg products before freezing or drying. Practical application has been dependent on the need for accurate control, because the time and temperature combinations required to destroy salmonellæ are near those which adversely modify the functional qualities of the product. Nevertheless, growing experience sug-

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In some factories, eggs are broken into a small receptacle, and smelled individually before being tipped into a bowl holding 12 eggs. These are smelled again before being tipped into a bucket, prior to final bulking.

gests that it is possible to achieve a high degree of bacterial destruction without impairment of usability.

The object of this contribution is to bring together some of the available knowledge of the preparation and bacteriology of frozen whole egg, and particularly of its pasteurisation, together with some hitherto unpublished data which may help towards an assessment of the value and practicability of pasteurisation.

Methods of making frozen whole egg

Although attempts have been made to eliminate the incorporation of defective eggs by mechanical and optical devices, and with some measure of success, the difficulty of doing so remains a most critical feature affecting the bacterial quality of the product.

In many factories the eggs are broken individually, and the content of each egg is inspected and smelt before being mixed with others. When defective eggs are found the contents are removed from the breaking room, and the breaking equipment concerned is taken away to be sterilised. This method is effective in protecting the pulp from eggs which are obviously undesirable. The candling of eggs before breaking is a safeguard of importance when the freshness of the eggs cannot be guaranteed. This saves waste of time in the breaking room, since the more obviously defective eggs can be removed before they are broken and infect the breaking equipment. These precautions do not prevent contamination of the egg pulp by organisms on the shell, nor do they eliminate the eggs in which pathogenic organisms occur or in which spoilage organisms are present but not yet apparent.

In some factories the breaking of eggs and the bulking of contents is done mechanically, but with such a process it is advisable to use only the freshest eggs and to incorporate a shell pasteurisation unit.

After the breaking operation the pulp is collected in a receiving tank, from which it is pumped continuously through fine mesh filters into coolers. In some plants the filtered pulp is chilled batchwise, but more usually it flows through heat exchangers in which it is quickly cooled to below 40°F. and passed to a filling tank. From this the pulp is filled into clean sterilised cans.

After being labelled to identify the batch, date and place of manufacture, the cans are quickly passed to the freezing chambers. It is usual in British practice to operate the freezing chambers at −10°F. to −15°F., and 16 lb. cans are usually frozen within 30 hr. Subsequently the frozen cans are stored at about 14°F.

Incidence of Salmonellæ in hen eggs, liquid hen egg and frozen whole hen egg

The pathogens with which eggs have been asscciated are mainly those of the salmonella group. Infected birds are a possible source of salmonellæ in eggs and egg products, and several workers have been able to relate their findings of salmonellæ in shell eggs to the presence of infection in the hen. Wilson[1] isolated *Salm. typhi-murium* from the yolks of 3 successive eggs out of a total of 30 laid by an infected hen. Gibbons,[2] investigat-

A general view of the breaking room in which the process illustrated above is carried out.

In an alternative system of breaking, carried out at the Ballymena factory, the eggs are tipped after breaking into a trough running under the breaking table.

ings eggs from infected flocks, found salmonellæ on 8 out of 24 shells and in 2 out of 144 contents. Elliott[6] also found salmonellæ in eggs laid by hens with infected ovaries. Möller[7] investigated an outbreak of *Salm. typhi-murium* food poisoning caused by eggs laid by an infected hen.

Crowe[8] has reported an outbreak of salmonella food poisoning presumably due to an infected hen egg. Watt[9] described an outbreak of food poisoning due to the presence of *Salm. montevideo* within hen eggs.

Other workers examining shell eggs of commerce have found salmonellæ. Cantor and McFarlane[10] isolated *Salm. pullorum* from 30 out of 2,584 contents and *Salm. montevideo* (5 times) and *Salm. anatum* (8 times) from 13 out of 2,182 shells. These workers have quoted from current literature the finding of nine salmonella serotypes from hen shells. Carter, Powell and Borts[11] isolated *Salm. pullorum* (5 strains) and *Salm. paratyphi B* (1 strain) from 186 bulked samples of hen egg contents. This finding of *Salm. paratyphi B* is interesting since it suggests that the presence of this organism in food may not always be due to direct infection from a human source, as is more generally believed.

Solowey, Spaulding and Goresline[12] examined the contents of eggs drawn from the daily allotment of two drying plants and found salmonellæ present in about 3·5% of dirty and washed dirty eggs. No salmonellæ were found in the contents of clean eggs, though 1·3% of their shells were positive, a proportion which increased almost to 5% for dirty and washed dirty eggs.

Some workers have examined shell eggs without finding salmonellæ. Bernstein[13] examined the pooled contents of batches of 24 eggs. In all 3,648 eggs from various sources were sampled, but no salmonellæ were isolated, and Gibbons[5] found no salmonellæ on the shells of 12,276 commercial eggs. Several investigators quoted by Solowey *et al.*[12] observed that the contents of clean eggs are generally sterile. Nevertheless, under suitable conditions, bacteria can penetrate the egg shell and infect the contents, and we have found that with some commercial egg-washing machines the proportion infected can be very high.

In view of the foregoing, it is reasonable to expect that shell hen eggs of commerce will inevitably contain a very small proportion bearing salmonellæ. When tens of thousands of eggs are bulked the chance of salmonellæ being present in the product is proportionately increased. If at any time the environment becomes favourable for the multiplication of this organism, a level of infection originally negligible may become of practical significance.

Examinations that have been made of liquid egg have shown the existence of salmonellæ infection in a small proportion of samples. Murdock[14] examined a total of 1,010 samples of liquid hen egg which was being processed at a freezing plant, and he found 21 positive samples. In a later investigation[15] this author found 13 positive samples out of a total of 606. In a survey of salmonellæ in liquid egg by the Public Health Laboratory Service,[16] 1,649 samples were examined and 9 of these were found to be positive. These latter samples were taken from packing stations which prepare small quantities of liquid egg for local sale, and the possibility that some of this liquid might contain duck egg cannot be excluded.

In the normal production of frozen whole egg there is no stage in the process which is completely lethal for salmonellæ. On the contrary, if the plant is not hygienically operated there will be opportunities for salmonellæ to multiply and even to be carried over from one batch to another. During freezing and subsequent cold storage a proportion of the total bacterial flora dies, but neither freezing nor cold storage can be relied on to entirely eliminate salmonellæ from the product. Extensive investigations carried out in the U.K. on home produced and on imported frozen whole egg have shown that this product, from all sources, is occasionally contaminated with salmonellæ. The Public Health Laboratory Service in a survey[16] to assess the importance of liquid egg as a possible vehicle of infection examined: (*a*) 345 cans U.K. frozen egg from one plant and found 7 cans with *Salm. typhi-murium* and 2 cans with *Salm. pullorum* (there was a possibility that the plant may have become infected after duck eggs had been processed); (*b*) 80 cans Australian frozen egg and found *Salm. typhi-murium* in 2 cans and *Salm. pullorum* in 15 cans; (*c*) 25 cans Chinese frozen egg and found *Salm. thompson* in 1 can; (*d*) 1 can Dutch, 1 can Danish, 8 cans Irish and found no salmonellæ. Smith and Hobbs[17] examined 128

cans of Chinese frozen egg and found *Salm. pullorum* in 18 cans, *Salm. thompson* in 7 cans, *Salm. aberdeen* in 12 cans and *Salm. typhi-murium* in 2 cans.

Newell, Hobbs and Wallace[18] examined 153 cans of Chinese frozen egg and found *Salm. thompson* in 20 cans, *Salm. aberdeen* in 1 can, *Salm. pullorum* in 23 cans, *Salm. paratyphi B phage Taunton* in 2 cans, *Salm. paratyphi B phage type* 1 in 2 cans and *Salm. paratyphi B phage type* 3 *A* in 2 cans. *Salm. pullorum* rarely causes disease in man. Further investigations have been recently reported by the Public Health Laboratory Service.[19]

Table 1

(data of Winter *et al.*)

Temp. °F.	Time (min. for destruction)		
	Salm. typhi-murium and others	Salm. cerro	Salm. senftenberg
150	0·3	0·4	0·5
148	0·8	1·3	1·6
146	0·8	2·0	1·9
144	1·2	2·0	3·6
142	2·0	2·3	3·8
140	2·6	3·3	6·7
138	3·7	4·5	8·5

Table 2

(data of Osborne *et al.*)

Calculated times required to reduce salmonellæ counts to less than 1 in 100 g. of liquid whole egg

Count: No. per g.	Pasteurisation times at following temperatures for strains of "ordinary" heat resistance (minutes)		
	140°F.	142°F.	144°F.
10	2·9	1·7	1·0
10,000	5·7	3·4	2·0
1,000,000	7·6	4·6	2·7
	Pasteurisation times for Salm. senftenberg 775W.		
0·025	4·4	2·6	1·6
0·1	11·0	6·6	4
10	33	19	12
10,000	66	40	24
1,000,000	88	53	32

Methods of elimination of Salmonellæ

Steps taken in the industry to keep the bacterial infection of frozen whole egg to a minimum have in the past been more particularly directed to avoiding spoilage or taints.

As already noted above, salmonellæ are not effectively destroyed by cold storage temperatures. Frozen whole egg which has been in cold storage for at least four years has been found by one of us (N. R. K.) to contain salmonellæ of various types.

Irradiation of eggs by cathode rays or gamma rays will kill salmonellæ with little or no adverse effect on baking quality.[20, 21, 22, 23, 24, 25] If it can be shown that this process does not initiate any new health risks and is commercially feasible, this application may well become one of the successful developments of this form of processing.

Pasteurisation is known to eliminate salmonellæ. The combinations of time and temperature tolerated by some strains, the effects of such times and temperatures on the quality of the egg, and the difficulties met in applying such treatment in practice are probably not widely known among producers of frozen egg. At present pasteurisation is the method most likely to be generally acceptable commercially. It is, in fact, in use, and is becoming more widely used.

Pasteurisation

Much work has been carried out, particularly in the U.S.A., on thermal death times for salmonellæ in liquid whole egg.

The death rate of vegetative micro-organisms is roughly logarithmic; Osborn, Straka and Lineweaver[26] have used the equation $2{\cdot}3 \log\frac{a}{a-x} = kt$ where a is the initial count, x is the number of organisms killed in time t, and k is a constant for the culture and temperature used. The number of organisms surviving a time-temperature combination depends, therefore, on the number of organisms initially present, and it is important to keep the initial counts in liquid egg at a minimum prior to pasteurisation.

The destruction of micro-organisms by pasteurisation does not necessarily eliminate any changes that have already been brought about in the egg prior to pasturisation. For example, in 1949-50 trouble was experienced with mustiness in imported pasteurised frozen egg. It was shown by Brooks[27] and Brooks and Hale[28] that the fault arose from the processing of some shell eggs that were contaminated with a species of *Pseudomonas*. Subsequently pasteurisation had killed these bacteria, but did not destroy the musty off-flavour they had already produced.

Payawal, Lowe and Stewart,[29] Goresline,[25] and Brooks and Taylor[30] all report a narrow heat range in which pasteurisation of whole egg can be carried out. Below 135°F. bacteria are not killed, and above 145°F. egg tends increasingly to coagulate, until coagulation is almost instantaneous above 163°F. — although van Oijen[31] found that egg could be batch-pasteurised at 150°F. for 20 minutes if 1% to 2% of sodium citrate was added as an anticoagulent.

The continuous pasteurisation of liquid egg has been studied in connection with U.S. dried egg production. Many authors have stressed the importance of accurate time-temperature control and of intelligent appreciation of plant operation. The slight, but inevit-

able, coagulation of egg and its deposition within the plant demands that a limit be set to through-put, followed by "descaling" of the plant. Slight adjustments of the time-temperature combination is usually necessary during the late stages of throughput, since the deposit of coagulated egg gradually reduces the efficiency of the heat-exchange process.

McFarlane, Watson and Goresline,[32] and Gibbons, Fulton and Reid[33] showed that holding liquid egg at 140°F. reduced the viable count by 98% or more and destroyed salmonellæ.

Stewart and his colleagues[34, 35, 36, 37, 38] extensively investigated the short-time pasteurisation of liquid egg. Winter *et al.*[36] investigated the temperatures and times necessary to destroy salmonellæ (4×10^4 to 10^6 per mil.) suspended in liquid egg and heat treated in a laboratory pasteuriser: 164 strains representing 16 salmonella types commonly found in egg powder were used. Salmonella types commonly found in eggs in the U.S.A. —*Salm. typhi-murium, pullorum, oranienburg, montevideo, tennessee, anatum, bareilly, meleagridis, derby, oregon, london, newington, kentucky, rubislaw*—were completely destroyed at the temperatures and within the times shown in Table 1.

The greater heat resistance of *Salm. cerro* and *Salm. senftenberg* should be noted. *Salm. senftenberg* and *Salm. cerro* have been occasionally isolated from dried egg, but it is not known whether these were heat resistant strains. The lack of information on the presence of *Salm. senftenberg* and *Salm. cerro* in egg suggests that they rarely occur.

Miller, Winter, Weiser and Wrinkle,[39, 40, 41, 42, 43] in various publications, reported that pasteurisation at 140°F.-142°F. for up to 4 min. reduced the total plate count by 99%, destroyed all salmonellæ, all (possible pathogenc) Gram negative enteric bacteria and almost all coliforms and Gram positive cocci.

Goresline, Hayes, Moser, Howe and Drewniak[44] found that commercial liquid whole egg flash heated to 140°F. and held at that temperature for 3 min. was free from salmonellæ, although many samples contained salmonellæ before pasteurisation. No specific investigation was made on the types of salmonella present, but the results agree with those of Winter *et al.*[36] assuming the absence of *Salm. senftenberg* and *Salm. cerro*. Schneider[45] reported that pasteurisation of liquid whole egg at 140°F. for 2-5 min. entirely eliminated salmonellæ.

Byrne[25] examined samples taken at various stages during the commercial production of dried egg and acidified dried egg. The salmonellæ content of the liquid whole egg ranged from 25,000 to 750,000 per 100 g. Salmonellæ were more resistant to pasteurisation in acidified liquid egg (*p*H 5·5). Pasteurisation at 140°F. for 3 min. in unacidified liquid egg was frequently effective, but failures occurred in 6 out of 91 samples.

Anellis, Lubas and Rayman[46] studied the heat resistance in whole egg of 10 salmonella strains originally isolated from spray-dried egg. Inoculations were adjusted to give 100,000 organisms per mil. liquid egg. It was found that thermal death time (T.D.T.) values at 140°F. changed as a continuous function with *p*H between 6·1 and 8·5, and the majority of the salmonellæ tested showed T.D.T. values of from 7 to 9 min. at *p*H 5·5 and 2 to 3·5 min. at *p*H 8·0. Marked differences were found among individual strains of the serotype *Salm. senftenberg* strain 775W, the most resistant studied having a T.D.T. value of 11·0 min. at *p*H 8·0, while three other strains had values of 2 to 3 min. at the same *p*H.

Osborne *et al.*[26] studied the effect of initial salmonellæ counts, as well as *p*H, on T.D.T. values for liquid whole egg, and a table is given for normal unacidified liquid whole egg.

About double these times would be needed to pasteurise liquid yolk and about one-third the times for egg white (apparently because of their lower *p*H and higher *p*H values respectively).

The U.S. Department of Agriculture's regulations[47] for the pasteurisation of liquid egg specify a temperature of not less than 140°F. and not more than 142°F. for not less than 3·5 min. and not more than 4 min. It appears that the pasteurisation of liquid egg is commonly practised commercially in the U.S.A. as a preliminary to the production of spray dried egg.

Knowles[48, 49] reported that holding liquid egg for 3 min. at 142°F. or 143°F. did not provide a sufficient margin of safety for the destruction of coliforms, and that a time - temperature combination slightly in excess of 2 min. at 146°F. may be regarded as satisfactory. He also found that samples of heat-treated egg contained viable salmonellæ only when taken towards the end of a normal day's run, samples taken during the early part of the process being uniformly negative. Successful heat-treatment necessitates an intelligent appreciation of the importance of plant operations and control at all stages. According to Knowles, survival of coli-aerogenes bacteria may occur in the late stages of prolonged plant operation by reason of decreased efficiency due to build-up of egg solids on the plate—a possibility which calls for accurate specification of throughput limits.

In Part 2 of this article, to be published shortly, the authors discuss the commercial production of frozen whole egg.

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(*Concluded on p. 253*)

Fundamental Aspects of the Dehydration of Foodstuffs - 2

Abstracts from the Aberdeen Conference

We publish below a further series of abstracts from papers read at the conference on the Fundamental Aspects of the Dehydration of Foodstuffs organised in Aberdeen by the S.C.I. Abstracts of other papers appeared in our May issue.

DETERIORATION OF DEHYDRATED MEAT DURING STORAGE

By J. G. Sharp (Low Temperature Research Station, Cambridge) and E. J. Rolfe (Ministry of Agriculture, Fisheries and Food Research Establishment, Aberdeen)

In presence of oxygen, the main cause of deterioration in quality of dehydrated meat during storage is the oxidative rancidity of the fat. If this type of oxidation is inhibited by means of an antioxidant, other oxidative changes take place and lead, in the presence of both the fatty and non-fatty fractions, to the development of a yellow-brown discoloration and unpalatable, stale, "mealy" flavours.

In absence of oxygen, there is no significant deterioration in the fat, but carbonyl-amino browning reactions take place in the non-fatty fractions with the development of red-brown discoloration accompanied, in the early stages, by meat extract, roast-type flavours which change to unpalatable, bitter, burnt flavours in the later stages of storage. These changes appear to be inhibited when oxygen is present.

Corresponding roughly in degree with the changes in colour and flavour, changes in the physical properties of the protein fractions occur simultaneously. These changes cause a decrease in the power of the proteins to reabsorb and hold water, with the result that the rehydrated meat has a much dryer and more brittle texture.

The browning reactants present in meat are free reducing sugars, mainly glucose and the ester glucose-6-phosphate, which react with the amino- and imino-groups of the proteins and the soluble amino-acids. The changes in flavour are caused mainly by interaction of glucose with the aqueous soluble amino-acids present.

The rate of browning increases with *p*H and also with moisture content up to a maximum at an R. H. of 60%. No appreciable inhibition of browning deterioration is effected over long periods of storage at temperatures of 37° and above, unless the moisture content of the meat is reduced to the equivalent of 16% R. H. or lower. This means a moisture content of 3·5% on a non-fatty solids basis or 2% in meat with a fat content of 40%.

CHEMICAL CHANGES IN THE PREPARATION AND STORAGE OF DEHYDRATED FOODS

By C. H. Lea (Low Temperature Research Station, Cambridge)

A loss of volatile flavour constituents, which can be serious for foods which depend to any marked degree on aroma for acceptibility, may take place during dehydration. On the other hand, mild heat treatment may bring about significant changes in flavour. Flavour changes of both types in dried milk were described.

The hydrolysis of lipids by enzymes, the oxidation of lipids by enzymes and heat-labile catalyst systems in various foods and the enzymic browning of fruits and vegetables were discussed.

Non-enzymic browning may develop rapidly during drying or more slowly during storage of dried product. Relatively high moisture content or storage in moist atmosphere and high storage temperatures accelerate the browning reaction. Non-enzymic browning is due to the reaction between reducing sugars and amino-compounds. The primary condensation products undergo a rearrangement and then polymerise to brown substances. The symptoms of non-enzymic browning were described, and browning in dried egg, dried skim milk, meat and fish, fruits and vegetables and model systems was discussed. Some measures to control the browning reaction were suggested.

Autoxidation of a fat or phospholipid was considered as consisting essentially of combination of the unsaturated fatty acids with oxygen to produce mainly hydroperoxides, which then react further by dehydration, fission, polymerisation or further oxidation to yield a variety of degradation products, including the volatile aldehydes, ketones and acids which are largely responsible for the objectionable odours and flavours.

During the oxidation of fats, other constituents of food such as pigments, flavour constituents and vitamins are also destroyed by the free radicals produced. Although these are only minor components of food on a weight basis, they are very important in determining appearance, palatibility and nutritive value, and damage to them can easily make a food unacceptable.

Factors which influence the oxidation of lipids, reactions between oxidising lipids and proteins, changes in phospholipids and lipoproteins and protection by antioxidants were enumerated.

In general, high moisture and temperature favour browning and low moisture and temperature favour rancidity. Evidence for the antioxidant activity of the products of browning reactions was discussed.

THE INFLUENCE OF THE CONDITIONS OF DEHYDRATION ON THE QUALITY OF VACUUM-DRIED MEAT

By E. J. Rolfe (Ministry of Agriculture, Fisheries and Food Research Establishment, Aberdeen)

Vacuum drying may be subdivided into two general procedures: (1) evaporation of water from the liquid phase and (2) sublimation of water from the solid (frozen) phase. These two procedures produce materials with markedly different properties.

The vacuum contact-plate (VCD) process in which evaporation of water from the liquid phase takes place was described. The dehydrated raw meat is dark red in colour and with a rather glossy surface free from pores. Because of structural changes and denaturation of proteins, reconstitution is incomplete and the water is loosely held. The eating qualities, are, therefore, inferior to those of fresh meat, particularly as regards texture. Pre-freezing the meat effects a considerable improvement in quality of dehydrated raw meat. It facilitates drying so that the tissue is subjected to a less severe heat treatment and also provides a somewhat porous structure in the dry product. The glossy impermeable skin is also less pronounced. The latter two factors are no doubt responsible for improved speed of reconstitution. By employing pre-frozen meat in vacuum-drying in molten fat or oil, a more palatable product is obtained.

In freeze-drying, water is removed from frozen tissues by sublimation of ice crystals. There can be no migration of water and hence no transport of soluble constituents. As the surface water is lost the drying front recedes within the tissue and case hardening is prevented. The frozen tissue is rigid and with removal of ice crystals, a porous, low-density material with the original dimensions remains. The porous structure facilitates reconstitution and the low temperature employed during the drying process keep to a minimum the damage to the structural proteins and the deteriorative chemical changes. Consequently the products conform more closely to the natural texture and structure of the original meat. Conventional freeze-drying of meat, accelerated freeze-drying of meat and the Canadian freeze-drying process were discussed in detail.

DIFFUSION AND THERMODYNAMICS OF WATER IN POTATO STARCH GEL

By B. P. Fish (Imperial Chemical Industries, Ltd., Billingham Division)

The dehydration process was described in terms of a diffusion coefficient which depends on the moisture content of the material. This coefficient varies over about three orders of magnitude in the range between dryness and saturation. Changes in the thermodynamic properties of water in starch gel occur as the moisture content is reduced, especially below 10% on the dry basis. The conclusion is that the slow transport of water in dry starchy material is associated with the loss of rotational freedom of the water molecules. The height of the energy barrier for the fundamental process of diffusion appears to increase as the moisture content of the material is reduced. Some practical remarks on the dehydration of gelatinous material were included.

DEHYDRATION OF VEGETABLES IN MULTI-STAGE CROSS-FLOW SYSTEMS

By E. G. B. Gooding and C. G. Tucker (Ministry of Agriculture, Fisheries and Food, Experimental Factory, Aberdeen)

Scalded vegetables contain 80-95% water, which is a much greater proportion than occurs in many other substances which are dried commercially. Except in leafy parts of green vegetables, the natural size of piece (*e.g.*, carrot) is much too thick to allow uniform and rapid evaporation from the whole of the tissue. It is usual to cut the material so that the thickness of piece is a uniform $\frac{1}{8}$ in. or $\frac{3}{16}$ in.; dimensions in other directions are less important. Most foodstuffs suffer heat damage during drying if they are held at temperatures above about 160°F. for protracted periods, especially if their water ratio has fallen below about 0·25 (*i.e.*, moisture content of 20%). In the early stages of drying, the rate of evaporation is governed by the drying power of the air and evaporative cooling maintains the temperature of the vegetables at or near the wet-bulb temperature of the circulating air and high dry-bulb temperatures are therefore permissible if the wet-bulb temperature is maintained at a low level. In the later stages of drying, evaporation becomes progressively slower and increasingly governed by the rate at which water can diffuse to the surface of the material and the reduced rate of evaporation rate allows the temperature of the material to rise, so that it gradually approaches and ultimately reaches, the dry-bulb temperature of the circulating air; this enforces the use of lower dry-bulb temperatures in these stages.

Dehydration of vegetables in tunnels with longitudinal air flow has certain disadvantages, in particular, that each succeeding bath is affected by those upstream. As alternatives to tunnels, three- and four-stage systems, employing counter-current air flow with interstage reheating to graded temperatures, have been examined. The three-stage system showed definite advantages over the twin tunnel system used during the Second World War, and the four-stage system was superior to the three-stage. The effect of operating variables was discussed in some detail.

▶ British Visqueen, Ltd., a subsidiary of I.C.I., Ltd., have produced a number of leaflets giving up-to-date information about the qualities of their Visqueen polythene film in some of its applications for food packaging.

▶ A leaflet has been issued on the *Keebush* diaphragm pump made by the Kestner Evaporator and Engineering Co., Ltd. In this pump, which is glandless, self-priming and suitable for acids and acid slurries, the body is of *Keebush* synthetic resin and the diaphragm and ball valves of synthetic rubber and flexible plastics.

Repairing Water Pipes by Freezing

THE repair and maintenance of pipework by water undertakings, and for industrial premises, generally causes considerable inconvenience because it involves interruption of water supply. There is also the risk from such interruptions of damage to hot water systems and contamination of the supply. It is, therefore, of considerable value if the pipework affected by the necessary stoppage can be reduced to the absolute minimum. Such a device has been produced by which water pipes of various kinds can be repaired by an efficient and ingenious method. It is simply the freezing of the water in the pipe, thus forming an ice plug so that the necessary repairs can be effected. The device is a "Freeze-Seal Unit," consisting of a portable refrigeration set, with a refrigeration compressor driven through a V-rope drawn either by a two-stroke petrol engine or electric motor.

In operating the unit for lead pipes the pipe is compressed flat by the closing tool (see illustration) being placed close to the burst and arresting the flow of water. Then the controlled drip tool is placed in position on the up-stream side of the closing tool, the centre spindle is screwed down to pierce the pipe to allow a free flow of water under pressure to the drip cork, which is adjusted to allow twenty drips a minute. The freezing tool, fitted with copper bushes suitable for the pipe size, is then placed round the pipe and clipped tightly on the up-stream side of the controlled drip tool.

A Freeze-Seal unit in operation on lead piping. The closing tool is seen compressing the pipe, and the freezing tool is clipped on the up-stream side.

Expansion prevented

The machine having been started up previously, the freezing tool will be already cold and will start to freeze immediately it is applied and will form an ice plug within the pipe. The drip tool, by allowing an escape of water, ensures that the ice plug is formed freely with a hollow centre of gradually diminishing bore until the final moment of seal. This free formation prevents any expansion of the ice plug which might cause distortion to the pipe under repair.

When the drip ceases to fall from the drip cock it is an indication that the water in the pipe is frozen, and the supply completely sealed off. The repair may now be commenced. On completion of the repair the freezing tool is removed and the ice plug will then thaw out completely in a few minutes.

For pipes other than lead instead of the closing tool and controlled drip tool, quick operating clips incorporating the drip tool are used, which are made to fit various diameter pipes and are lined with rubber. The clips are fitted loosely round the pipe clear of the burst and then slid over and tightened up. This having been effected the cock is adjusted to allow twenty drips a minute.

Users of this equipment have found that road reinstatement charges and water wastage have been reduced to a minimum because of the speed with which repairs can be effected. A perfect seal free from drips is obtained and time and labour are saved. In addition the equipment is useful for locating invisible leaks and obviates the necessity of cutting the pipe for testing or opening long trenches for examination; while it can be used for testing mains and services.

Enquiries about this equipment should be addressed to the Editor of FOOD MANUFACTURE.

▶ The Association of British Chemical Manufacturers has published their third booklet in the series *Notes on Work Study*.

Described in this publication are 21 case histories of applications in a wide variety of operations. The savings effected in these examples range from £200 per year in the case of a small materials handling problem to about £10,000 per year in an application to plant maintenance. It is hoped that these case histories will be sufficiently impressive to encourage the smaller organisations to utilize the techniques of work study, which it has not been the intention to describe in detail.

Advances in Food Technology

CANNED FOOD

Insecticide Residues

The flavour of canned fruits and vegetables is liable to be affected by insecticides sprayed on the trees or soil. A particularly effective insecticide is the γ isomer of hexachlorocyclohexane (HCH), known as Lindane, which has a less disagreeable odour than technical H.C.H. Research carried out at the Central Laboratory of the Belgian Ministry of Economic Affairs, Brussels, has shown that Lindane is partly decomposed under the influence of heat. During sterilisation, the quantity of Lindane contained in canned vegetables was found to be reduced by 63%. On the other hand, the disagreeable flavour and odour of the remaining insecticide becomes more marked. These organoleptic properties often appear after sterilisation, although they could not be detected beforehand.—S. van den Driessche, *La Revue de la Conserve de France et de L'Union Française*, 1958, **13**, 27.

ANALYSIS

Determination of Copper in Gelatine

Quantitative chemical analysis was used to determine the content of ascorbic acid, thiamine and riboflavine in raw and preserved vegetables—*i.e.*, peas, beans, cucumbers, tomatoes and carrots; the carotene content of carrots was also investigated. Preserves were also made from raw materials which had been previously analysed in a raw state, the preserves also being analysed after 6 months' storage. The value of vegetables as a source of vitamins was determined from the results.

Preserved mashed tomatoes proved to be a particularly valuable source of ascorbic acid, and carrots were found to contain substantial amounts of carotene. The remainder of the preserves proved to be only moderately good to meagre sources of vitamins.—Z. Charlampowicz, *Przemysl Spozywczy*, 1957 (2), 67.

FRUIT

Cold Storage of Table Grapes

The lifetime of fresh grapes can be extended through cold storage by an average period of 3 months, varying with the species of grapes and with the soil and atmospheric conditions of the year of the vintage. It is necessary to choose large-grain varieties with strong stalks and with sugary pulp of small acid contents. The grapes must be kept at a constant cold-storage temperature and in moist air, so that a periodical disinfection is required. The grapes should be pre-cooled as soon as possible after harvesting and should, if possible, be pre-packaged in transparent material, which must not, however, prevent the vital interchange of gases.—J. A. Munoz-Delgado Ortiz, F. de la Camara Comella, M. Estada Giranta, *Revista del Frio*, 1957, **2**, 285.

Elimination of Pathogens

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Machinery and Equipment

CENTRIFUGES

The range of *Super-D-Canter* centrifuges made by Sharples Centrifuges, Ltd., has been increased by the addition of 2 new models, the P4000 and the P7000.

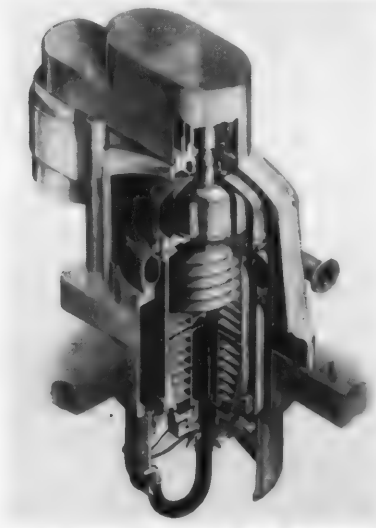
A new design concept has been introduced into the construction of these scroll discharge type centrifuges. It is stated that the new design gives an increased performance and capacity exceeding that previously believed to be possible with this type of machine.

These machines are vertically mounted and have a self-centering bowl. Sharples claim that this design allows the gearbox to be made integral with the bowl and thus the spline shaft used can be short. In this way a satisfactory gearbox can be made for handling large solids capacities.

The new models operate at centrifugal forces of up to 3100 × S.

AIR-OPERATED STIRRER

An air-operated stirrer has been added to the range of portable-type stirrers made by the Kestner Evaporator and Engineering Co., Ltd. It is additional to those operated by a totally enclosed or flameproof-type of electric motor. The claim is made that it is completely flameproof, the prime mover being a rotary-vane air motor suitable for working pressures of up to 90 lb. p.s.i., with an integral sun-and-planet reduction gear driving a stainless steel or plastic-coated shaft which is fitted with two opposed propellers. The makers say that its small size and light weight are among its advantages over the conventional totally enclosed electric motor. The fitted air control gives a flexibility which provides variable speed operation. An adjustable bracket and mounting clamp is provided for direct attachment to the rim of the mixing vessel.



A sectional view of the Sharples P 7000 Super-D-Canter showing the vertically mounted bowl design.

HOT WATER BOILER

A forced circulation boiler for hot water and process systems has been introduced by Edwin Danks and Co. (Oldbury), Ltd. Known as the *Corner Tube* boiler, it incorporates several features designed to meet modern requirements.

The boiler has a natural circulation which comes into operation in the event of a pump or line failure, thus minimising the danger of a tube failure. The boiler is of completely welded structure in which the downcomers, distribution and collector tubes are interconnected so as to give a tubular structure. Costs are claimed to be reduced by this structure which carries the heating surfaces, the setting and the casings. Another feature of the boiler is the water-cooled cage which is the same temperature as the heating surfaces, giving an even expansion of all parts.

Pre-heating of the cooler return water in the rear tubular bank before introduction to the collectors and furnace is claimed to eliminate water hammer and thermal shock to the high temperature surfaces.

REACTION COATINGS

The resistant properties of reaction coatings to a wide range of chemical effects in food processing equipment are being developed by Acalor (1948), Ltd., under the name *Acalistic Coatings*.

The advances that have been made in the toughness, acid and alkali resistance and applicability of these materials are said to make it possible to treat a range of equipment in the food processing and chemical industries. The materials are also stated to be inert to contamination.

Applying coatings to form laminates of progressive resistance gives greater surface adhesion, toughness throughout the film and a highly resistant surface, according to the makers.

They may be applied on site without contaminating odours or the need for high temperatures, giving them a wide range of use.

The air-operated stirrer made by the Kestner Evaporator and Engineering Co., Ltd.

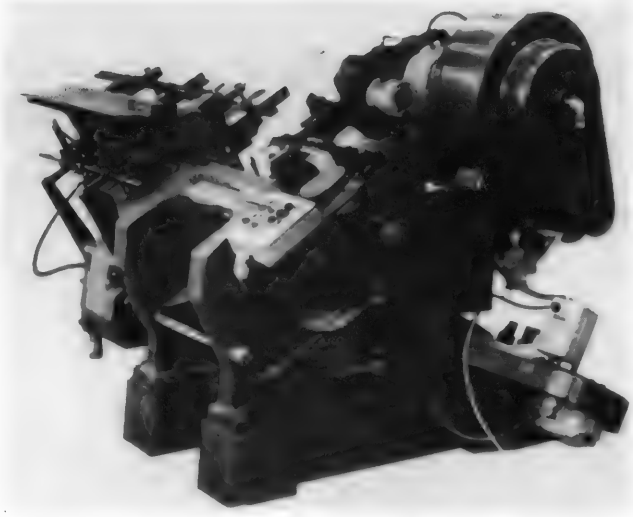
PACKAGED STEAM GENERATORS

Marshall, Sons and Co., Ltd., announce that they have concluded a licence agreement for the manufacture of packaged steam and hot water generators with the Cleaver-Brooks Co., an American firm.

A range of oil-burning, fire-tube units from 500 to 20,000 lb. steam per hr., with pressures up to 250 lb. p.s.i.g., is covered by the agreement. All these boilers are of four-pass design and the advantage of this principle is to maintain a continuously high flue gas velocity essential to high heat transfer by reducing the number of tubes in each successive pass.

As hot gases travel through the first, second, third and fourth passes, they transfer heat to the boiler water and then cool and occupy less volume. The cross section of gas-flow area (*i.e.*, number of tubes) is then reduced proportionately to maintain high gas velocity, resulting in constant and complete heat transfer.

These higher velocities through the four passes of the boiler are said literally to scrub the tube surfaces clean and increase the heat transfer by improving the gas film co-efficient.



This Bliss strip press produces 600 can ends per min.

Both boiler ends are hinged, allowing the doors to swing open exposing the tubes for cleaning and servicing. The front head incorporates a low pressure air-atomising oil burner which can be removed quickly for cleaning. The rear door is lined with refractories and swings out of the way for easy rear end inspection.

BOTTLE WASHING MACHINE

A new bottle washing machine capable of handling 24,000 pt. bottles or 18,000 qt. bottles per hr. is now being made by Dawson Bros., Ltd. Called the *Centurion*, it is claimed to give good bacterial counts for 3 reasons.

The first is that on entering the machine the bottles are given an internal pre-rinse at about 70°F. which is pumped from a tank and afterwards allowed to run to waste. This tempers the bottles as well as removing most of the foreign material. A second pre-rinse follows at 90°F. rinsing both the outside and the inside of the bottles. This is recirculated by a pump. Pre-rinsing efficiency is said to ensure that the detergent section is relieved of a great deal of the contamination.

The second reason for a good bacterial count is that cylindrical pressure filters, using nylon pads, are incorporated in the 3 detergent jetting sections between the pump delivery and the jet pipes to filter the detergent solution. The 3 detergent washes are at 135°F., 160°F., and 110°F. respectively.

Thirdly, both the warm water rinse and the final cold rinse are taken direct from the mains eleminating the old method in which the warm rinse water was re-used, which, could encourage the growth of bacteria.

Economical operation and ease of maintenance are claimed for the *Centurion*, which has an improved automatic feed and discharge for handling the bottles. The machine requires less floor space than previous machines of the same capacity.

FORKLIFT TRUCK

A new forklift truck has recently been introduced by Ransomes, Sims and Jefferies, Ltd. It is the largest in the *NR* series of forklift trucks made by this firm.

Known as the *NR40*, it has a capacity of 4,000 lb. at a load centre of 24 in. or 2 tons at 20 in., and is equipped with an *Exide Ironclad* 18 TLU 23D battery.

Attention has been paid to the fork profile, where all surplus metal has been discarded leaving a fork section stated to give maximum strength with minimum weight. The truck's mast is of new design. Its collapsed height has been lowered by one in. without loss to the lift height, and the mast's re-styling gives the operator better vision. It is a compact machine, and its turning circle has been reduced so that right-angle stacking is possible in an aisle 91 in. wide plus the length of the load.

An outstanding feature claimed for the truck is the introduction of a dual-speed motor. By altering the terminals at the back of the control panel the top speed unladen can be reduced from 5¼ m.p.h. to 4¼ m.p.h. or vice versa. This enables power-saving in varying floor conditions, and maximum economy is possible on long, straightforward runs or in close congested spaces. The initial starting current alone is said to be considerably reduced using the lower top speed.

A diverter can be fitted as an optional extra to give a fifth speed. A maximum lift height of 14 ft. is available, at which height the carrying capacity remains unchanged.

CANNING MACHINERY

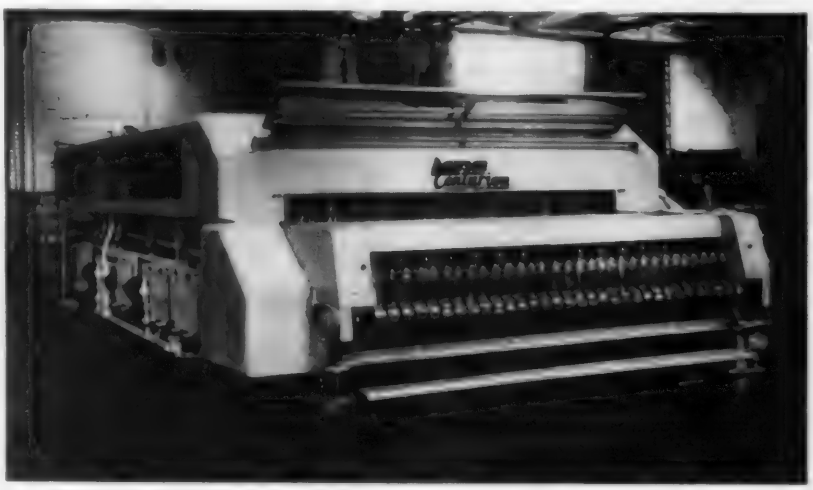
Several new machines have been announced by E. W. Bliss (England), Ltd.

The first of these is the No. 1831 automatic-feed strip press which is said to be one of the fastest offered to the canning industry. The machine produces can ends at the rate of 600 per min. It is fitted with double curling and stacking attachments.

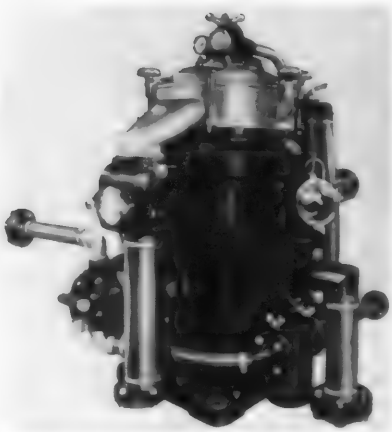
A combination disc friction clutch, electrically controlled, is said to give instant starting. A balanced crankshaft and feed bar crank are incorporated which virtually eliminate vibration and give smooth, silent operation at high speeds.

The master control box is mounted directly on the press and all controls are readily accessible. Special limit switches stop the machine immediately in case of jams and if a limit switch is actuated the press timing is arranged for the slide to stop automatically at the top of its stroke.

The firm have also produced a scroll shear No. 1100 which blanks scroll cut strips for can ends, bottle caps, jar and similar tops at 90 to 120 strokes per min. from plain or lithographed sheets.



The Dawson Centurion bottle washer is supplied with adjustable feet (not shown here). No special foundations are required.



The De Laval PX 207 self-opening separator which may be used for the separation purification of animal fats, etc. It has automatic sludge ejection.

Among the new features are magnetic feed bars which assure accurate feeding of sheets and an intake trimming slitter which is capable of "hair-line" cuts.

The slide is counterbalanced to maintain precision at high speeds. Replaceable wear strips which are built into the frame are used for back-guiding the slide.

Normally the bed on this shear, which takes 36 in. square sheets, is equipped with magnetic feed bars to handle ferrous sheets, but it can also be furnished with mechanical finger feed bars for non-ferrous metals.

LIDDING MACHINE

The latest *Autopack* machine has been designed to lid and cap composite drums, small bottles, tins, etc., with diameters up to about 2 in. One of the more important applications of the machine is that of lidding pepper and spice drums at speeds of 30 to 120 per min., thus providing, according to the makers, Autopack, Ltd., very considerable savings in labour costs. The containers are received on the inlet conveyor, and delivered by a patented timing device into the pockets of a continually moving rotor, while the lids are fed into pockets in the top portion of the rotor from a standard unscrambling hopper. Both drum and lid are firmly held and positioned one above the other, until at a convenient point in the movement of the rotor they are brought together and the lid is pushed tightly home. The completed pack then passes on to the outlet conveyor.

Overload devices will immediately stop the motor in the case of overloading, or incorrect operation. The motor itself incorporates a brake and stops instantly, while a coloured light system indicates the reason for the stoppage. A hand wheel for hand feed is provided and is so arranged that the machine cannot be switched on if the hand wheel is engaged, and the machine cannot be operated at all unless all covers are firmly in position. A variable speed drive unit provides speeds from 30 to 120 per min.

SEPARATORS

Several new separators have recently been introduced by Alfa-Laval, Co., Ltd. Among these was the type *PX 207*, a self-opening separator intended for the purification of animal fats, etc. The machine ejects the separated solids while it is running at full speed, the purified liquid being discharged from the separator under pressure. The centrifuge may be fully controlled by an automatic timing device which cuts out the need for manual supervision.

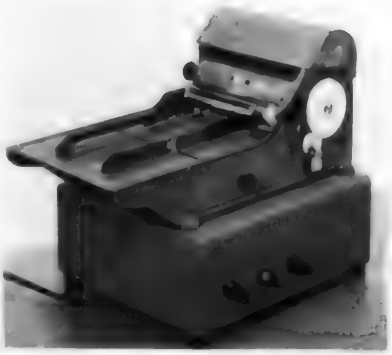
The firm has also developed a new large hermetic clarifier, type *BRH 214*, which has a 23 in. bowl. Liquids may be separated or clarified by this machine without coming into contact with air.

A laboratory size separator has also been developed by the firm. It follows the pattern of the larger commercial separators and may be used for both laboratory work and pilot scale work.

OVERPRINTING MACHINE

An overprinter capable of printing up to 6,000 labels per hr. has been introduced by Dapag (1943), Ltd. Known as the *Tickopres* VM, it is a 150 r.p.m. rotary printing machine which is claimed to be so accurate in its registration that the same label can be overprinted 6 times experimentally before it is noticed that the label has been through the machine more than once.

The machine, which is powered by a 240 v. A.C. motor, can be used to print labels, bags and collapsible containers up to a size of 6½ in. × 5⅝ in. It may also be used for printing tickets only 1½ in. sq. The machine will overprint on a number of different surfaces.



The new Tickopres VM electrically driven overprinter produces 6,000 labels, tickets, etc., per hr.

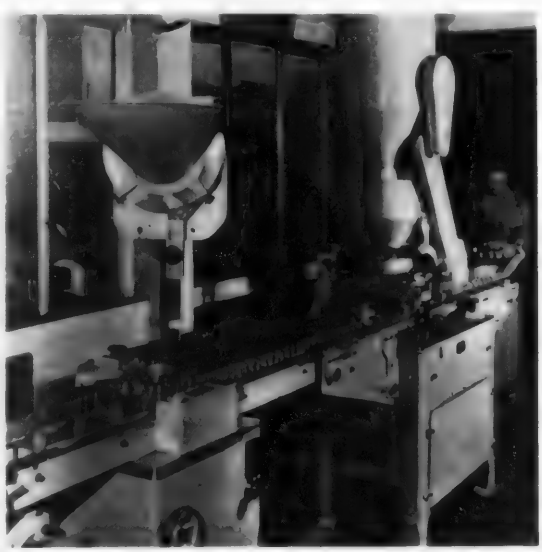
Plates and stereos are used for brand names and similar matter. These may be easily changed and the use of interchangeable type-drums allows the type to be kept set-up for re-use.

VACUUM CLEANER

What is said to be an entirely new floor cleaner capable of suction/sweeping/polishing up to 15,000 sq. ft. of floor per hr. has been introduced by the Progress Organisation.

Designed to clean large floor areas, the *General*, as it is known, has a 20 in. brush. The machine has an oscillating principle of operation which is claimed to eliminate pull.

It is powered by a 0.85 h.p. motor and has only 2 moving parts. Conversion from polishing to scrubbing is said to be instantaneous and any brush can be fitted in a matter of seconds.



This lidding machine is working in conjunction with an Autopack automatic pepper drum unscrambling table and filling machine.

News Digest

Faith in British Bacon

Despite the fact that British bacon has been suffering from very severe competition in recent years, considerable faith in its future has recently been shown by at least one firm. On April 25 last the official opening took place in Birmingham of a new bacon factory and pork pie bakery built by M. Bywater and Co., Ltd., a firm with a local reputation which has been maintained for 125 years.

Considerable Government interest has been shown in the planning and construction of the building, which has been erected as an extension of the firm's older premises at Small Heath, Birmingham, at a cost of £150,000. It is the first factory of its kind to be built in this country for 20 years.

The new bacon factory occupies 12,800 sq. ft. of floor space, and the pork pie bakery 10,000 sq. ft. In addition, a sausage department, which is in the course of construction, will occupy 4,500 sq. ft., and there will be 3,000 sq. ft. of refrigerated storage. When in full production, the pork pie bakery will have a capacity three times as great as the old one which it replaces; a travelling oven with a capacity of 2,880 pies per hr. is being installed. The bacon factory will handle 120 pigs per hr.

The decision to make large-scale extensions to the factory was taken three years ago, and in the intervening time Mr. R. E. Blanning, chairman and managing director of the company, has travelled widely in Denmark, Sweden, and Holland studying the best features of pig-processing systems in these countries.

The factory contains several novel features, including provision for CO_2 stunning prior to slaughter, and the rapid chilling of carcases. Both installations are the first of their kind in this country, and the factory as a whole has been described as the most up-to-date in Europe.

One hundred and thirty guests attended the opening ceremony at the invitation of Sir Ambrose Keevil, president of the company. They included the Deputy Secretary of the Ministry of Agriculture, Fisheries and Food, Mr. Henry Hardman, and representatives of the Pig Progeny Testing Board and the Warwickshire, Shropshire, Staffordshire, and Worcestershire branches of the N.F.U. The opening ceremony was performed by the guest of honour, Lt.-Gen. Sir Archibald Nye, chairman of the Pig Industry Development Authority.

Food Machinery Association

The annual dinner of the Food Machinery Association was held on May 15, following the annual general meeting. Speaking at the dinner, the newly elected president, Mr. W. Bryan Draper—who was last year chairman of the association—devoted a good deal of attention to the possibilities inherent for food machinery manufacturers in the proposed European Free Trade Area. He pointed out that exports of British food machinery to the Common Market countries in 1957 were higher than those for the engineering industry as a whole, and suggested that the liberalising of a wide range of industrially processed foods would present further great opportunities for the industry.

Mr. Draper also pointed out that when one was dealing with the highly civilised countries of western Europe, it was often possible to sell individual machines on a keenly competitive basis, whereas many other overseas markets, including some Colonial territories, were interested more in the equipment of whole factories—frequently a difficult achievement for specialised firms.

Mr. Draper also laid great emphasis on the importance of expert technical advice to overseas firms, and suggested that whereas in former days trade followed the flag, it was today more likely to follow the technical expert. He also paid tribute to the importance of the technical press in keeping its readers informed of new developments, and appealed to members to do their share by seeing that editors are regularly supplied with information about new developments and technical advances.

Sir Edward Thompson, J.P., the guest of honour, replied on behalf of the guests.

Post-Graduate scholarships

The Pig Industry Development Authority has announced that it is to sponsor scholarships to promote investigation and research in problems relevant to the problems of pig production.

The scholarships will initially have a value of £500 per year, and will be tenable for periods of 2 or 3 years. They will be available to suitable graduates in veterinary medicine or agriculture. Principal faculties and colleges teaching these subjects have been informed of the institution of these awards, and applications are invited from students who will graduate this summer. The Authority at this stage envisages the award of 2 scholarships in veterinary medicine and 4 to other graduates.

Shipping exhibition

The largest fishing port in Great Britain—Hull—is to be the venue for the International Shipping and Commercial Fishing Exhibition from September 11 to 17, 1958.

The exhibition will place on show the latest industrial and commercial developments in all aspects of the shipping and commercial fishing industries from all over the world.

Standards for Q-F herring

Standards for quick-freezing and cold-storing herring and herring products were introduced on May 1 under Statutory Rules, which have been approved by Ministers. They have been published by the Herring Industry Board.

It is pointed out that these rules are effective for 1 year. This will give the trade time to prepare for the prescription of the more exacting standards considered to be a desirable longer-term objective by both the Board and those engaged in quick-freezing and cold storage.

Copies of the rules can be obtained from the Herring Industry Board, 1, Glenfinlas Street, Edinburgh, 3.

Q-F boneless kipper fillet

John Kelly, Ltd., kipperers, of Newhaven on the Firth of Forth have introduced a new quick-frozen boneless kipper fillet. Earlier they introduced a fresh kipper fillet designed for wet fish trade and by this development extend their coverage to frozen food cabinets.

PEOPLE

R. K. Briggs

J. G. W. Collins

P. Shirley

A. V. Lewis

Robert Carr, M.P.

MR. F. O. ACKROYD, A.M.I.MECH.E., A.M.I.PROD.E., has been appointed to the board of Crofts (Engineers), Ltd.

■

MR. SAMUEL BENEDICT has been appointed sales director of Fisher's Foils, Ltd. He has been with the company since 1944 and previously held the appointment of purchasing director.

■

MR. R. F. FARMER, assistant secretary of the Incorporated Plant Engineers Institution since 1952, has been appointed secretary of the Institution in succession to MR. HADLEIGH S. SEABORNE.

■

MR. GRANVILLE HORSLEY has been appointed to the board of Crofts Engineers (Holdings), Ltd. He has also been appointed joint managing director of the operating company, Crofts (Engineers), Ltd.

■

MR. J. H. FEATHERSTON has been appointed transport manager of T. Wall and Sons (Meat Products), Ltd. He will be responsible for more than 500 vehicles of all kinds, whose monthly mileage is in the region of 600,000.

■

MR. DAVID D. MARSHALL, of the Greengate and Irwell Rubber Co., Ltd., was re-elected chairman of the British Rubber and Plastics Belting Manufacturers' Association at its recent annual general meeting for 1958-59.

■

MR. ROBERT KEITH BRIGGS has been elected to the board of Arthur Holden and Sons, Ltd. He was educated at Cheltenham and Queen's College, Oxford. During the war he served as a subaltern in the Royal Horse Artillery.

Mr. Briggs has specialised in research, production and selling in connection with the range of coatings, varnishes and lacquers falling within the company's Metal Decorating and Food Lacquer Division.

MR. J. W. G. COLLINS has been appointed assistant managing director of John Dale, Ltd. He is 45, and his connection with the John Dale Organisation goes back to 1929 when, as an employee of Cassleton Elliott and Co., he worked on John Dale's annual audit of accounts. He joined John Dale, Ltd., in 1945 as works accountant. He was intimately concerned in the formation of John Dale (Canada), Ltd., in 1952.

■

MR. PHILIP SHIRLEY, at present chief accountant, Unilever, Ltd., has been appointed chairman of Batchelors Foods, Ltd., and will take up his new post on July 1.

He succeeds Mr. M. W. Batchelor, whose forthcoming resignation was recently announced.

Mr. Shirley, is 45 years of age, and was born in Sydney, N.S.W. He joined Unilever in June, 1951, as deputy to the chief accountant, and became chief accountant in 1952.

■

MR. G. LE P. HUNT and MR. A. V. LEWIS have been appointed to the board of Kraft Foods, Ltd.

In January, 1957, direct service to the trade was obtained through ten sales branches each having its own sales force, warehouse and delivery staff and complete office staff for administration. As comptroller, Mr. Lewis was largely responsible for the success of this operation. Mr. Hunt, general production manager, was closely concerned with the transfer of all production and head office administration to the new factory at Liverpool.

■

MR. S. E. CLOTWORTHY has been elected president of the Aluminium Development Association for 1958-59. He is managing director of the Northern Aluminium Co., Ltd., and he has been with that company for over 30 years.

DR. MAURICE COOK (chairman, I.C.I. Metals Division) has been elected vice-president.

MR. WILLIAM D. BERGER has been appointed president of the Oppenheimer Casing Co., in succession to the late Mr. Edward H. Oppenheimer. Mr. Berger has been associated with the Oppenheimer Casing Co., for 19 years, in later years as vice-president of the company.

Mr. Berger's concern was mainly with the supply of raw materials from all parts of the world, and in his activities in this direction he has travelled extensively and acquired an intimate knowledge of all aspects of the sausage casing business.

■

MR. ROBERT CARR, M.P., who recently relinquished his appointment as Parliamentary Secretary to the Ministry of Labour and National Service, has accepted an invitation to become chairman of the John Dale Group of companies. He will continue as member of Parliament for Mitcham, which constituency he has represented since 1950. Appointed Parliamentary Private Secretary to Sir (then Mr.) Anthony Eden in 1951, he toured with him in both Canada and U.S.A. He also paid official visits to Yugoslavia and Austria in 1952 and to Thailand, Singapore and Malaya in 1955, when he attended the S.E.A.T.O. Conference in Bangkok. He has held the ministerial appointment which he has now resigned since December 1955. He has also held the Secretaryship of the Conservative Parliamentary Atomic Energy Committee.

Mr. Carr has served an apprenticeship, not only in the metallurgical field but in the same firm he now rejoins as chairman. Joining John Dale, Ltd., in 1938 he worked in the moulding and tube departments. A period as shift foreman in the billet and ingot foundry in 1939 was followed by experience as a radiologist and in 1945 he became John Dale's metallurgist, a post he held until 1948 when he was appointed director in charge of research and development.

Mr. Robert Carr, who is 41, is a Fellow of the Institute of Metallurgists.

Obituary

The death is announced of MR. GWYN EDWARDS, for the past five years manager of A. Webb and Co., Ltd., sausage casings manufacturers, Ore Valley, Hastings, Sussex. He was 35.

*

The death is announced of MR. FRANK A. WOOLF, managing director of Yeatman and Co., Ltd., in his fifty-eighth year. He was a man of vision and integrity under whose able direction the company has expanded and prospered. He joined the company in 1916 and was elected to the board in 1925, became joint managing director in 1935, and managing director in 1949.

Everyone in the company's employ suffers a personal loss, for Frank Woolf knew them all and few have not benefited from his kindliness, understanding and help.

*

The death of MR. EDWARD H. OPPENHEIMER, president of the world-wide sausage casing house, brings to an end another era in the history of the company formed in 1914 by Harry D. Oppenheimer.

Mr. Edward H. Oppenheimer took an active part in all company operations, and regularly toured all his factories and offices, making a very friendly personal contact with each of his employees. A family spirit was built up and the whole Oppenheimer organisation co-ordinated in a team of happy workers, who mourn not only the loss of their president, but also a friend.

He is survived by his wife and three sons.

*

The death is announced at the age of 78, of MR. JOHN HAMPTON PAWLEY, a director of George Cohen and Co., Ltd., whom he joined 51 years ago. Up to last December, Mr. Pawley, who had many close friends in the iron, steel and allied industries, was in personal, day-to-day control of the firm's dismantling activities—involving every year the negotiation, and general supervision, of hundreds of major contracts in Britain and overseas.

Until his last illness he used to drive daily between his home at Beaconsfield and his London offices. He invariably arrived before 9 o'clock, and left at some indeterminate time after 5.30—having, with unfailing good humour and kindliness, got through more business than most men of a third of his age.

He leaves a widow, a daughter and a son, also named John Hampton Pawley, who has been a member of George Cohen's Machinery Division for the past 20 years.

OBITER DICTA

● The uptake of milk has developed a downward tendency.—*Milk Marketing Board circular.*

● When a cafe proprietor was questioned by police officers concerning meat which he was alleged to have received, he said: "I know that it looks fishy, but I didn't know anything was wrong."—*Report in Meat Trades Journal.*

● But sugar bags are the bane of my life. To quote the pop song, it's sugar in the morning, sugar in the evening and sugar at suppertime—all over the cupboard shelf and the kitchen floor.—*Letter in Evening News.*

● Across counters made sacred by golden sovereigns and bradburies, such frivolous objects as lobster patties and cheese straws were passed last night. The place was the National Provincial Bank at No. 1, Lombard Street.—*Daily Telegraph.*

● Banana plant-breeding experts are already concentrating on producing a strain resistant to the Panama disease. Could they not at the same time take a tip from the sausage maker and offer us a skin-less fruit?—*Travers' Circular.*

● In the workers' canteen, Mr. Mikoyan became the fraternal delegate from abroad. He repeatedly shouted "Peace and friendship" in German, and asked a girl peeling potatoes why the management did not provide her with a mechanical peeler.—*Daily Telegraph.*

● A U.S. Air Force research report, "an evaluation of popcorn as a cushioning material" reveals that popcorn has been used in packaging electronic equipment. But "stress-strain" and other tests showed that it was a poor cushioning material.—*Popcorn-Concession Merchandiser.*

● During a recent shopping expedition in California, I saw a package labelled "Freshly Frozen Olde Englishe Crumpets." Alas, although I followed the instructions, the result could only be likened to a rock bun in its most advanced stages. Although it appeared to be porous, the crumpet resisted all attacks with butter, jam or honey.—*Letter to Manchester Guardian.*

Wall's buy new factory

T. Wall and Son (Meat Products), Ltd., have bought the factory of Kraft Food Products, Ltd., at Hayes, Middlesex. The factory occupies a site of about 6 acres, and has a total floor space of nearly 250,000 sq. ft. Facilities include laboratories, cold stores, and office and administrative buildings. The factory will be used to supplement the firm's production of sausages, meat pies, and other meat products.

Distributor sought

The Swedish firm of AB Hven Plast, Vattenverksvägen 1 B, Malmö, who manufacture a range of tanks and wheeled containers made of polyester resins re-inforced with fibreglass, are interested in finding British distributors with contacts in the food industry. The vessels are reported to be highly resistant to chemical action, and to be suitable for salting meats and for handling fruits and other acid products. They also have applications in the dairy industry. Interested firms should contact the Swedish firm direct or the Swedish Chamber of Commerce for the United Kingdom in London.

New processing unit for refiners

There is to be an additional processing unit built at the Battersea factory of Manbre and Garton, Ltd., according to the annual statement of the chairman, Mr. A. E. Berry. He said that the unit would cost £305,000.

The sales of the group have expanded steadily and, with the exception of refined sugars, there has been general lowering of prices. They have acquired a small company in the north of England during the past year. The progress of their South African subsidiaries in the past year was stated to be satisfactory.

The group trading profit amounted to £1,562,028. A total distribution of 22% was approved.

Millers burned out

Damage estimated at about £50,000 was caused recently by a fire which gutted the factory of Spillers, Ltd., millers, at Ripley, Derbyshire.

The fire is thought to have started in some waste material and to have spread to the first floor of a 2-storey building, where it ignited many tons of flour and sugar. Four hundred bags of flour and a large quantity of sugar were destroyed before the fire was brought under control.

Although 160,000 loaves, which were ready for delivery were saved, thousands of cake cartons and wrappings were destroyed, as well as a considerable quantity of machinery.

Food News Overseas

New Australian Factory for Cerebos

Mr. W. Arnold Innes, chairman of Cerebos, Ltd., made a brief visit to Australia in connection with the opening of the new factory of Cerebos (Australia) Pty., Ltd., in Clayton, Victoria.

During his stay Mr. Innes met industrialists and the leaders of various trade associations at a series of receptions in Sydney, Melbourne, Adelaide and Hobart.

The factory is a splendid example of modern architecture and is attractive, bright and spacious. From its position of eminence on one of the State's main highways, it overlooks the picturesque Dandenong Ranges to the east and Port Phillip Bay to the west. It has a floor area of 47,000 sq. ft. and stands in a garden setting on a 10-acre site which allows for big future expansion. The main floor of the factory is light and airy, the saw-tooth roof construction permitting natural light. The packing floor alone has an area of 24,800 sq. ft. and its roof is supported by only two pillars which leaves a working area free of encumbrances.

Materials, fast automatic packing and sealing machinery, and stock are laid out in such a manner as to allow the work to flow across the 12 ft. width of the floor, with packing materials entering the west side loading bay and packed goods leaving from the east side. The company has made full use of palletising and gravity roller conveyers for the movement of stock. A large basement on ground level is provided for the intake of raw materials of a heavy nature, which are elevated direct to the manufacturing room.

Soft colours have been used in the packing area and the whole effect is pleasing to the eye. The walls are light green, the ceiling white and the two pillars are picked out in daffodil yellow. Doors are painted red and other woodwork, such as that which encloses the Gravox and Bisto manufacturing room, is grey, bordered with a darker green than that used on the walls.

Excellent conditions have been provided for employees, among the numerous amenities being hot and cold showers, and in addition foot baths for women. A modern canteen with parquet flooring runs across the full width of the top floor of the administrative block and opens on to a balcony overlooking the Dandenong Ranges.

The factory was officially opened by the Premier, Mr. H. E. Bolte, who said he admired the company's move in selecting Victoria as the site for its headquarters. He expected that in a few years the big development between this factory area and Dandenong would be known as the industrial centre of Australia. He predicted a great upsurge of development in Victoria and said that migration was directly related to the progress of any country. Australia's migration policy was sound and there was less unemployment in Victoria than in any other State.

Mr. Arnold Innes told guests at the reception that it was a great honour to receive the Premier, not only for the Australian company, but also for the Cerebos Group as a whole, as this was the first time any factory in that Group had been so honoured. Mr. Bolte had done magnificent work not only for Victoria but also for all Australia. As an ambassador he had won immeasurable goodwill in Great Britain, the Continent and America.

Mr. Innes presented to the Premier a set of George III silver salt cellars made in 1806 by the famous silversmith, William Adby.

After the ceremony the Premier and guests were shown through the offices and factory and they displayed the keenest interest in the company's high-speed machine for packing its refined vacuum-produced Saxa Salt, an operation which was previously carried out in England. They also saw the high-speed machine for packing the company's well-known products, Gravox and Bisto, besides the various other modern machines.

While in Melbourne Mr. Innes presided at a series of meetings of the Australian Company, the Deputy Chairman and Chief Executive of which is Mr. K. R. Clements.

During his stay in Australia Mr. Innes, who was accompanied by his wife, also visited Sydney, Canberra (where he was received by the Prime Minister, Mr. Menzies), Adelaide and Tasmania. At the conclusion of his tour he sailed for New Zealand.

Frozen foods in Australia

Birds Eye Foods (Australia), Pty., have begun production of frozen foods at a garden city plant near Melbourne. Special refrigerated stores have been built.

The Birds Eye company is a subsidiary of Birds Eye Foods of Britain. In Australia the company will pack about eight different types of vegetables and berry fruits.

Australian wine research

The Australian Wine Research Institute's new laboratories at Glen Osmond, Adelaide, have been opened by the Federal Minister of Defence, Sir Philip McBride.

A sum of £500,000 has been made available by the Australian Government for the establishment and maintenance of the Institute. A major aspect of the research will be experiments in ways of increasing the yield and quality of Australian vines.

Industries for Antigua

The following industries have been declared pioneer industries by the Government of Antigua: boiled sweets and chocolate; animal and poultry feeding stuffs; and cornmeal for human consumption.

Israeli chocolate merger

Two of Israel's most important chocolate enterprises, Elite and the Ce-De-Company, have merged since Elite (Ramat-Gan) purchased controlling interest in Ce-De, also in Ramat-Gan. Both plants will continue their operations. It is also understood that the merger will in no way affect the construction now going on in Nazareth of the chocolate factory planned by Ce-De. On completion of this new and modern plant, the old factory at Ramat-Gan will close down.

Tea factory for Mauritius

The Government of Mauritius has come to an agreement with the Nuwara Eliya Tea Estates, Co., Ltd., to form a subsidiary which will supervise the erection of a new Government tea factory on Crown Lands and to manage the new factory and the Midlands Tea Estate on behalf of the Government for up to five years, reports Barclays Bank D.C.O.

The company, the report goes on, has been given an option for the duration of the managing agency agreement to lease the Midlands Estate and certain adjoining land on its own behalf. The company is appointing one of its senior estate superintendents in Ceylon as manager for Mauritius.

Expansion plans for African pyrethrum

The Pyrethrum Board of Kenya, acting on behalf of Kenya, Tanganyika and Belgian Congo growers, has established a European technical sales headquarters in London and has greatly extended research facilities in Kenya.

These decisions were made known by Mr. Norman Hardy, O.B.E., executive officer to the Pyrethrum Board of Kenya.

The European headquarters will be known as the African Pyrethrum Technical Information Centre Ltd. (APTIC).

Dr. T. F. West, D.SC., PH.D., F.R.I.C., A.M.I.CHEM.E., has been appointed to head it with the title of European operations executive. He was until recently a director of Drug Houses of Australia, Ltd.

In Kenya, the post of director of scientific services has been given to Dr. Alan Goldberg, D.SC., PH.D., D.I.C., F.R.I.C., well known for his researches into chemotherapy and toxicology.

Erection of the Pyrethrum Board of Kenya's extraction plant at Nakuru in Kenya has begun, and Mr. J. Huntley, from Hull, has arrived in Kenya from England to manage it.

The Board, acting on its own behalf and on behalf of the Pyrethrum Board of Tanganyika and the co-operative (Société Co-opérative des Produits Agricoles — SOCOPA) to which most of the congo growers belong, is to undertake a major sales and technical advisory campaign in Germany during the coming year.

The Kenya and Tanganyika crop amounted to 4,097 tons during 1957 and that of the Congo to 1,571 tons. It is believed that growers will be in a position to double these quantities as demands extend.

Given the growing resistance of insects to synthetic insecticides, they are confident that this can be done.

Swedish sugar plant

After a number of years of technical co-operation between the Swedish Sugar Co.—which controls Swedish sugar production and imports—and two Swedish engineering firms, fully automatic sugar centrifuges are now being manufactured, and a large number of orders has been received for them.

The four processes of filling, acceleration, centrifuging and ploughing of the sugar are programme controlled, while a rotating selector governs feeding and discharging. Automatic washing can also be included in the system. Owing to the various viscosities and other properties of refined and low-grade sugar, it is necessary to have recourse to different speeds and different centrifugal forces. The driving equipment is designed to provide three constant speeds for filling, centrifuging proper and ploughing. These speeds are adjustable within wide margins.

Ice cream in East Africa

Hundreds of cartons of ice cream made in Britain are making their appearance in distant parts of East Africa—where the day temperature this month (in Mombasa) seldoms falls below 91 degrees. The secret is a new refrigerated container which can go anywhere. Its first destination is Uganda.

This is the first of a series of shipments by T. Wall and Son (Ice Cream), Ltd., to establish the practicability of supplying their ice cream not only to Kampala but to many hot, up-country towns where good ice cream is not often seen.

In readiness for the arrival of the first refrigerated shipment of ice cream two specially designed mobile refrigerators were made ready at the quayside in Mombasa. Ten feet long, with built-in refrigerators, each holds 600 cartons of ice cream at sub-zero temperatures. They will be taken up-country by rail and road, and during their return journey to the coast they may help to solve another of East Africa's catering problems by bringing back other food products to the coast.

NEWS FOR IMPORTERS

Exemption from duty.—The Board of Trade is considering an application for the exemption from duty of citrus fruit, and citrus fruit peels, preserved in brine.

North American apple imports.—The Board of Trade has announced that there will be a quota for the import of canned apples from North America to a value of £100,000 c.i.f. for the period ending June 30, 1958.

A Notice to Importers giving full details of the arrangements will be issued shortly by the Import Licensing Branch of the Board of Trade.

Canned salmon from North America.—The Board of Trade announces that the quota for the import of canned salmon from North America during the year ending June 30, 1959, will be £4·5 million c.i.f. This is an increase of £1 million c.i.f. in the quota for the year ending June 30, 1958 announced on June 21, 1957.

A Notice to Importers giving full details of the arrangements will be issued shortly by the Import Licensing Branch of the Board of Trade.

Canned Salmon.—The Board of Trade announces that the quota for canned salmon imports from Japan has been fixed at £6 m. for 1958-59, an increase of £1 m. over the previous rate. The quota for canned salmon from North America was recently increased by the same amount and these increases should go a long way to meet demand in this country.

Provision has also been made for small increases in the Japanese quota for canned fruit.

Rice.—The Treasury have made the Ottawa Agreements Order, 1958, and the Import Duties (Exemptions) (No. 5) Order, 1958, which exempt: (*a*) rice in the husk, and (*b*) husked rice which has not been further processed after husking from the Customs duty of 6s. per cwt. chargeable under the Ottawa Agreements Act, 1932, and from the 10 per cent. *ad valorem* duty chargeable under the Import Duties Act, 1932.

International margarine federation

Representatives of 13 European nations met at Scheveningen, Holland, on April 15 and 16 to discuss the formation of an International Federation of Margarine Associations.

British delegates to the conference were Mr. George Walker, president of the Margarine Manufacturers Association; Mr. Jasper Knight, chairman of Van den Berghs and Jurgens, Ltd.; and Mr. A. J. C. Hoskyns-Abrahall, chairman of Van den Berghs, Ltd.

The purpose of the federation is to collate and issue information on margarine manufacture and to give advice on problems common to all countries.

Packaging

The carry-home pack made by Bowater-Eburite, Ltd. Part of the side is cut out to display the contents.

Self-adhesive strapping tape

A new self-adhesive strapping tape, *Sellotape* reinforced banding tape, is being marketed by the Industrial Sellotape Division of Gordon and Gotch, Ltd.

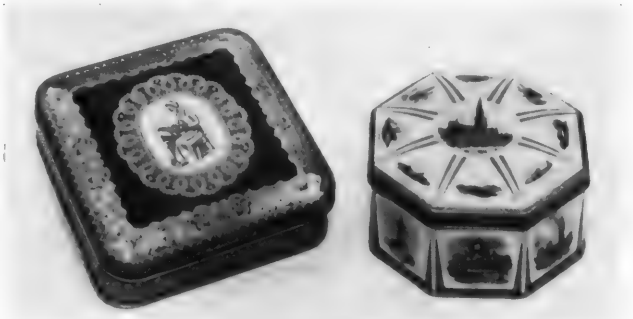
With a minimum tensile strength of 180 lb. per in. width, the tape strengthens containers and is claimed to be an economical and more efficient alternative to steel strapping. Each inch width has ninety 300 denier rayon threads laminated to vinyl film. The tape does not require a tensile machine or special equipment. It is believed to be 3-4 times as fast as strapping methods which rely upon the carton being completely encircled.

Decorating jelly in tubes

A decorating jelly for cakes, pastries, etc., packed in metal tubes has been introduced under the trade name *Fiesta*. It is made by Ian Dexter, Ltd., and is available in 3 different flavours and 3 contrasting colours.

Special display packs for stockists have been designed in the form of an iced cake with lettering in 4 colours, by Robert P. Hymers, Ltd., together with several other covers for smaller arrays. The tubes are made by the Flexile Metal Co., Ltd., and are decorated in yellow, green, blue and red with the colour of the ingredients of the particular tube predominating. Special names have been given to each of the 3 flavours in which they are available: Frolic Yellow (tangerine), Picnic Green (greengage), and Party Red (raspberry).

These souvenir chocolate boxes were made by the Metal Box Co., Ltd.



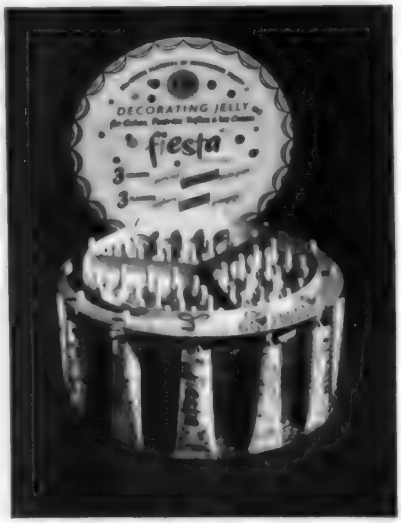
Puff pastry pack

The latest addition to the Birds Eye range of quick-frozen foods is *Puffin* puff pastry. The pastry is wrapped in *Cellophane*, packed in a waxed carton and quick-frozen.

The pack itself is coloured in blue, yellow, red and white. The product is being supported by television advertising and window bills.

It is stated that the puff pastry is suitable both for savoury and sweet pastries, and that it is made with a soft cooking fat, essential for making good puff pastry. It takes about 1½-2 hr. to thaw out. American research is said to have proved that puff pastry improves with quick-freezing.

There is sufficient in each carton for covering a 1 pt. pie dish, 6 mince tarts or 12 sausage rolls.



These Fiesta decorating jellies made by Ian Dexter, Ltd., are packed in collapsible tubes made by the Flexile Metal Co., Ltd.

Boned kippers

Smethursts Grimsby, Ltd., have announced the introduction of a pack of *Regent* boned kippers. This pack is the first addition to the *Regent* range of quick-frozen foods since its introduction early this year.

Carry-home pack

A carry-home pack for the beverage trade is now being made by Bowater-Eburite, Ltd.

Made from one piece of single-faced corrugated kraft board, it is self-locking and can be used for up to 6 mineral water bottles, ½ pint bottles or cans of beer.

It can be printed all over in black or colour, and is equally handy as a general-purpose carrier for shop use or pre-packed by a manufacturer.

Brussels Exhibition souvenirs

Decorated tin chocolate boxes, designed and produced by the Metal Box Co., Ltd., are on sale at the Brussels Universal and International Exhibition. One is octagonal, and illustrates the theme "All Roads Lead to Brussels." The lid shows Brussels Hotel de Ville, and is surrounded by eight small drawings depicting various modes of travel, ranging from a helicopter to a motor scooter. Round the body are eight more pictures emblematic of the countries which have entered the Exhibition.

The other is square, and printed in gold and green. The picture on the lid of a woman lace-maker at work is bordered by a gold design of Brussels lace.

The tins have been produced for 2 of Belgium's leading confectionery manufacturers. One of the manufacturers is inserting a handkerchief made of real Brussels lace into each box on top of the chocolates.

The Metal Box Co's Worcester Ware is also on show at the Exhibition.

Trade Marks

MILLARS.—758,633. Jams, marmalades, jellies (for foods), canned fruit, lemon curd, pineapple curd and mincemeat. **Andrew Millar and Co., Ltd.,** Ravenhill Preserve Works, 1, Millar Street, Belfast, Northern Ireland.

TEXIS. — B765,463. All goods included in Class 29. Canbury, Ltd., 119, Charterhouse Street, Smithfield, London, E.C.1.

KILROSS. — B766,295. All goods included in Class 29. **John Quinn, Ltd.,** Milestone Buildings, O'Hagan Street, Newry, Co. Down, Northern Ireland.

MALGA SUPREME.—767,572. Imitation cream (for food). **Malga Products, Ltd.,** Bridge Road, Southall, Middlesex.

BLACK DIAMOND.—767,620. Cheese. **Black Diamond Cheese, Ltd.,** 364, Pinnacle Street, Belleville, Ontario, Canada.

NEWTIME NURSERY RHYMES. — 759,932. Non-medicated confectionery. **Quality Foods, Ltd.,** 179/181, Park Avenue, London, N.W.10.

WALL'S MAGNUM.—765,902. Fruit-flavoured ice confections. **T. Wall and Sons, Ltd.,** "The Friary," Friar's Place Lane, Acton, London, W.3.

CHOCA - TELLY.—766,143. Chocolate biscuits, chocolate-coated shortbread and chocolate-flavoured cakes. **W. and R. Jacob and Co. (Liverpool), Ltd.,** The Aintree Biscuit Factory, Aintree, Liverpool, 9.

YODEL.—767,160. Non-medicated confectionery and preparations consisting wholly or principally of chocolate for use as food or as ingredients in food. **A. W. McIntosh and E. L. Halliwell, trading as Dornay Products,** Dundee Road, Slough, Bucks.

INGOTS. — 768,106. Chocolate, chocolates and non-medicated confectionery. **W. and M. Duncan, Ltd.,** 27, Beaverhall Road, Edinburgh.

LOULOU. — B684,137. Canned pineapples. **Anderson and Coltman, Ltd.,** 29, Mincing Lane, London, E.C.3.

HILARITY.—B684,138. Canned fish, canned meat, canned fruit and canned vegetables. **Anderson and Coltman, Ltd.,** 29, Mincing Lane, London, E.C.3.

MIRALIS. — B684,140. Canned fish, canned meat, canned fruit and canned vegetables. **Anderson and Coltman, Ltd.,** 29, Mincing Lane, London, E.C.3.

COUNTRY FARE.—751,728. Canned meats. **F. Cook, Ltd.,** Alfred Road, Morrebank, nr. Liverpool, New South Wales, Australia.

STIMULA.—758,243. Meat; fish, poultry and game, none being live; jam, marmalade, lemon curd; edible oils, edible fats; and cheese. **O. Kavli Aktieselskap,** Damsgaardsveien 59, Bergen, Norway.

FINMAIDEN.—764,525. Butter made in Finland. **Max Minden and Co., Ltd.,** 66/68, English Street, Hull.

WHIPEAM.—765,841. Imitation cream (for food). **The Sistacream Co., Ltd.,** 27, Lister Road, Hillington, Glasgow, S.W.2.

SUNNY COAST. — 766,526. Canned fruits and canned vegetables. **Vicente Lambies Algarra,** Benicarlo, Castellon, Spain.

ICEBOAT.—B684,164. Canned fruit and canned vegetables. **Anderson and Coltman, Ltd.,** 29, Mincing Lane, London, E.C.3.

SUNRISE.—753,320. Margarine. **Thomas Hedley and Co., Ltd.,** Phœnix Buildings, Collingwood Street, Newcastle-on-Tyne.

Technical Press Review

June

World Crops. — Provision of Water for Irrigation; Advances in the Irrigation of Pastures in New Zealand; Conserving Soil with Pastures; Review of the Crop Protection and Pest Control Exhibition.

Manufacturing Chemist. — Preview of the Chemical and Petroleum Engineering Exhibition; Nitrofurans and Pharmaceuticals; The SKF Factory at Tonbridge; Ethylene Oxide Products in the Soap Industry; Non-Ionic Surface Active Agents—2; Alcohol and Alcohometry; Progress Reports: Perfumery and Essential Oils; Therapeutics.

Dairy Engineering. — Electrical Equipment for Dairies; Maintenance and Control of Refrigeration Plant; Survey of Refrigeration Plant; Milk Publicity: A Comparison between British and American Methods; Spring Meeting of the Society of Dairy Technology.

Paint Manufacture.—Preview of the Chemical and Petroleum Engineering Exhibition; Surface Coatings Derived from Tall Oil; The Second Conference of the Association of Printing Technologists; Review of Plant and Equipment.

Petroleum.—Nickel and Cobalt Catalysts in the Petroleum Industry; An Immersion Viscometer· Economic Air Drilling; Instrumentation at Tidewater Oil Refinery; Recent Progress in Sulphuric Acid Alkylation; The Aspropyrgoas Refinery.

Building Materials.—Notes on the Design and Construction of Gatwick Airport; Forecast of New Buildings; Illustrations of Architectural Drawings at the Royal Academy.

Chemical and Process Engineering.—Chemical Engineering and the Quest for Abundant Power; Carbon in Industry; Review of Size Reduction Development; Review of the Chemical and Petroleum Engineering Exhibition.

Automation Progress.—Electronic Controls at a Modern Sugar Factory; The Instrumentation of Chemical Process Plant; Programme-Controlled Roughing in an American Steel Mill; Electro-Magnetic Brakes and Clutches in Recent Automatic Plant; A Low Cost Spectrophotometer.

For specimen copies write to Leonard Hill House, Eden Street, London, N.W.1.

New Companies

Anderson Brothers (Confectioners), Ltd. (598143.) 185, Tredegar Road, Bow, London, E.2. £1,000. Dirs.: T. and Ian Anderson.

Ashursts (Confectioners), Ltd. (598346.) 91, Red Bank Road, Blackpool. Dirs.: Martha B. Ashurst, Elizabeth E. P. Westmoreland, and Joan M. Burt.

Associated Midland Brewers, Ltd. (596891.) £500. Dirs.: A. E. Wiley, Manor House, Cleeve Prior, nr. Evesham, R. H. Butler, G. W. Cornwell, and A. H. Walker.

Buisman Co. (Great Britain), Ltd. (598312.) To import, mnfre., produce, market, buy, sell and deal in blending or flavouring powders for use with coffee or other beverages, etc. £10,000. Dirs.: M. J. C. Olland and G. B. E. Scheuler. Subs.: F. S. Fryer and B. C. M. Mote, 1, Arundel Street, London, W.C.2.

Country Packers, Ltd. (598451.) Sussex House, Hobson Street, Cambridge. Mnfrs., packers, pre-packers, canners, bottlers, buyers and sellers of foodstuffs, etc. £200. Dirs.: Ivor J. and Mrs. Joan M. Northridge.

Dairy Supplies (Hereford), Ltd. (597081.) The Cattle Market, Hereford. £3,000. Dirs.: P. B. Coyne and R. J. Clark.

Alexander Davis (Holdings), Ltd. (598589.) Quality House, 1-2, Wardour Street, London, W.1. Distillers, mnfrs. of and dealers in spirits, wines, liqueurs, beers, porter, ales, cider, etc. £100. Subs.: H. G. Brown and T. W. Haswell.

Deep Freeze (Luton), Ltd. (598603.) Charles Street, Luton. Poultry processors and public cold storage contractors, contractors for deep freezing, quick freezing, etc. £3,000. Dirs.: E. J. and Ella I. Cornthwaite.

Grantham Pre-Packers, Ltd. (598530.) 32, Avenue Road, Grantham, Lincs. Pre-packers and canners of fruit, vegetables, agricultural and dairy produce, etc. £500. Dirs.: J. Church and E. Whaley.

Hill's Soft Drinks, Ltd. (598114.) Stockbridge Road, Padiham. £5,000 Dirs.: T. D. Hill, F. Marshall, Elsie M. Hill, and Ruth Marshall.

Ladgres, Ltd. (597809.) Mnfrs. of and dealers in foods, drinks, sweets, confectionery, etc. £100. Subs.: Jean and T. A. Herbert, 156, Strand, London, W.C.2.

Marsh's Soft Drinks, Ltd. (597512.) £1,500. Dirs.: J. A. and F. H. Taft, Cedarwood, Dunsley, nr. Kinver, Stourbridge.

Nutrikem, Ltd. (599420.) Yorkshire Penny Bank Chambers, Harrogate. Mnfrs. of and dealers in vitamins, oilcake, corn, seed, etc. £1,000. Subs.: G. W. Dennison and Roy Clinning.

W. Stoneley and Co., Ltd. (596916.) Feeding stuff merchants. £30,000. Subs.: C. H. and Mrs. M. Stoneley, 2, Park Road, Southport.

St. John's Bottlers, Ltd. (597640.) Brewers and licensed victuallers; bottlers, N.W.8. £250. Dirs.: A. L. Fredman and E. Herlinger.

These particulars of new companies recently registered have been extracted from the daily register of Jordan and Sons, Ltd., Company Registration Agents, 116, Chancery Lane, London, W.C.2.

Recent Patents

COMPLETE SPECIFICATIONS ACCEPTED

794,002. J. KARPF: Meat mincer.
794,050. SKINNER CORPORATION: Process of producing a nutrient liquid from a coconut and the resultant product.
794,187. BAKER PERKINS, LTD.: Manufacture of tin bread.
794,240. L. PETERS: Food package.
794,437. J. LYONS AND CO., LTD.: Manufacture of wrapped portions of a sweetmeat and more particularly ice cream.
794,538. R. P. C. CARCASSONNE-LEDUC: Process and apparatus for the industrial and continuous cooking of rice.
794,546. A. EDER, S. V. N. POWELSON and E. KUHN: Food tins.
794,625. GIMSON AND CO. (LEICESTER), LTD.: Bottle-washing machines.
794,662 S. CROSS: Sterilising milk.
794,744. GENERAL FOODS CORPORATION: Quick cooking dry rice.
795,211. N. TRABACCHI: Closures for containers for preserves and the like.
795,364. MILOKO PRODUCTS, LTD.: Process and apparatus for increasing the solubility of powdered milk.
795,625. HOLSTEIN AND KAPPERT MASCHINENFABRIK PHOENIX GES. and B. KAISER: Bottling of beer and other drinks containing carbon dioxide.
795,633. HALIFAX DAIRIES (1939), LTD.: Machines or apparatus for washing food containers and similar articles.
795,859. F. J. BIENEFIELD: Apparatus for sealing bottles by means of a sheet metal closure cap.
796,025. BAKER PERKINS, LTD.: Bread-handling apparatus.
796,348. J. A. BENCKISER GES. CHEMISCHE FABRIK: Manufacture of sausages with soft, thin natural intestine.
796,499. GOODYEAR TYRE AND RUBBER CO.: Package of pastry dry mix and method of using same.
796,528. UNILEVER, LTD.: Shortening.

ABSTRACTS OF BRITISH PATENTS

Moulding blocks of butter or margarine

This invention is concerned with machinery used in the moulding of blocks of plastic materials such as butter or margarine. It provides a compensating means for use in the machine between the material feeding device and the block moulding means. Broadly, this device is a duct, the capacity of which may be temporarily increased during the period when the moulding means is closed to the material feed, so that no opposition is put in the way of the continuous output of the feeding means. The capacity of the duct is decreased as the material is fed to the moulding means without applying additional pressure to the material temporarily held in the duct.

The duct may be formed by a branching reserve cylinder. This cylinder has a moveable piston held in contact with the material by compressed air, forming a wall which automatically adjusts itself to maintain a suitable capacity for the material.—790,629. *Brecknell, Dolman and Rogers, Ltd.*

Fish processing

An object of the present invention is to provide a method of skinning fish and then freeing the fish flesh from the skeleton.

A headed, gutted and finned fish is heat-treated or blanched by briefly heating at a temperature in the region of 200°-225°F. by any suitable method. The time required for the process depends largely upon the size of the fish and the temperature of treatment. Moist heat should be used at temperatures above 225°F.

After blanching the fish is subjected to a high-pressure stream of water, steam or air to roll back and detach the skin of the fish. The pressure required is usually in the region of 50/100 lb./sq. in. and it should be directed at an angle of about 45° for the utmost effect.

The fish is then cooked to loosen the flesh from the bones. This is not complete but only enough to loosen the flesh, which is then separated by a jarring action and screening such as is provided by a perforated tumbling barrel or a vibrating screen. The bones are separated from the fish flakes by hand or gravity separation or any other suitable means. The flesh is recovered and rinsed.—792,651. *Birds Eye (Holdings), Ltd.*

Dispenser for non-flowing materials

The object of the present invention is to provide an improved means for imparting a cyclic rotational movement to the pocketed drum of machines for delivering meal and other non-free-flowing materials by volume. These machines are of the type which have a drum revolving on a horizontal axis with compartments or pockets at the periphery of the drum into which the material is fed from above and from which it is delivered below.

Provision is made for an infinite variation in the angle of movement which can be imparted to the drum at each movement of the driving means.—789,186. *Henry Simon, Ltd.*

Preserving foods

This invention relates to the preservation of food products, particularly those which are packed in jars.

It is stated that in the vapour-vacuum method of sealing jars it is usual for the jars to be set aside to cool after the hot products and the vapour have been added to the jars. The length of time taken by the jars to cool varies according to the size of the jars and their contents, but there is no doubt that a large storage space is required while the products are cooling. Attempts have been made to use cold water to reduce the temperature of the jars, but the water frequently gains access to the jar before sufficient time has elapsed for an air-tight seal to be formed.

According to the invention a method is proposed in which the upper portion of the hot jars is cooled by cold air being directed against them after sufficient time has elapsed for the vapour to condense and form a seal. Cold water is afterwards directed against the jar to cool it and its contents.

Between the addition of the lid and the application of the cold air steam may be blown against the lid to sterilise it.

Apparatus for performing the operation has a tunnel structure with a conveyor running through it. Nozzles are provided for directing jets of steam, cold air and cold water, the jars passing through the jets of different media in that order.—793,580. *Robert Kellie and Son, Ltd.*

Meat or fruit pasty machine

Tart or pie making machines are in use in which operations take place in different positions on a rotating table, all these operations taking place on successive articles, at each position of the table while the latter is stationary. The present invention relates to a machine of this type, and more particularly to an attachment to such a machine for making such items as turnovers or pasties.

The device consists of 2 plates which are hinged together, one lying flat on the rotating table of the machine and the other adapted for folding over the pastry and sealing and trimming the edges. In operation the piece of pastry is placed on the apparatus at the first point. The filling is placed on the pastry at the next point and the pastry is moulded to shape and the surplus crimped off at the next point.—793,539. *Alexander Harvey.*

Improved filter press

This invention relates to an improvement in the construction of filter presses, particularly those used for filtering beet sugar juices, which enables the collected filter mud to be removed from the filters without the machine being dismantled or even opened.

There is provided a filter press with a closed container in which there are a number of filter frames, each of which is covered with a filter cloth. The sugar juice is passed into the container and passes through the filter cloth to the interior space of the filter frames leaving the mud on their exterior. The filtrate flows through special conduits and out.

The impurities in the form of this mud are removed by means of a water spray emitted from a turntable and longitudinally moveable, water-carrying pipe with nozzles.

It is claimed that the filter press not only reduces the inconvenience of removing the mud but also reduces the space required by the filter press.—793,476. *Roman Szarejko.*

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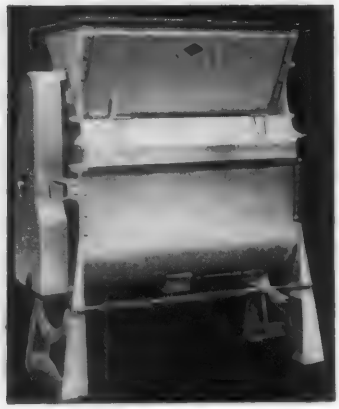

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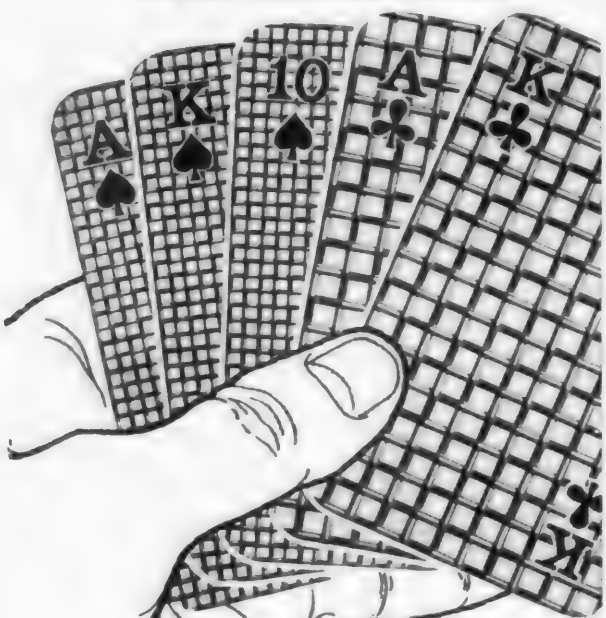

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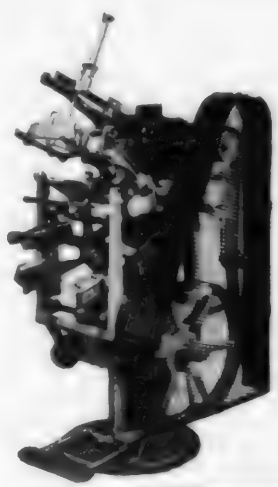

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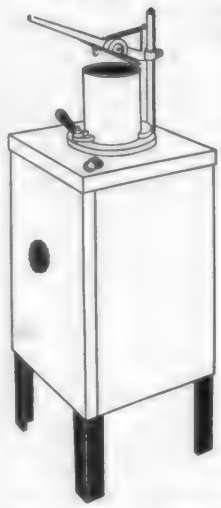

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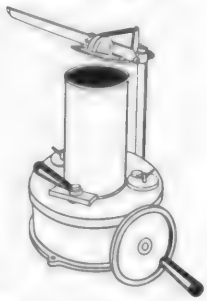

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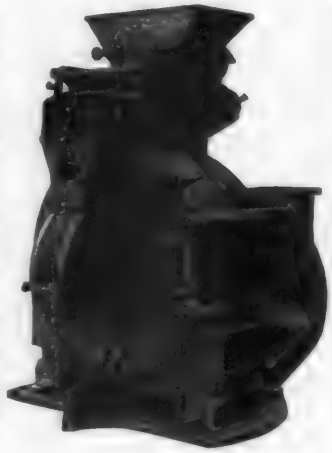

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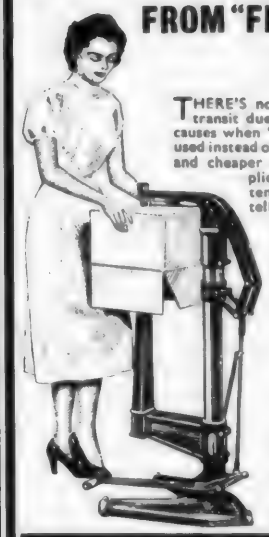

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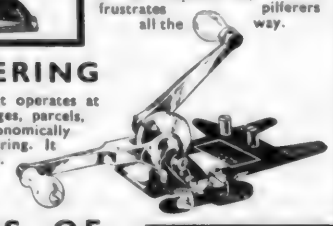

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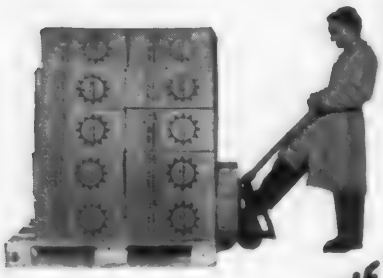

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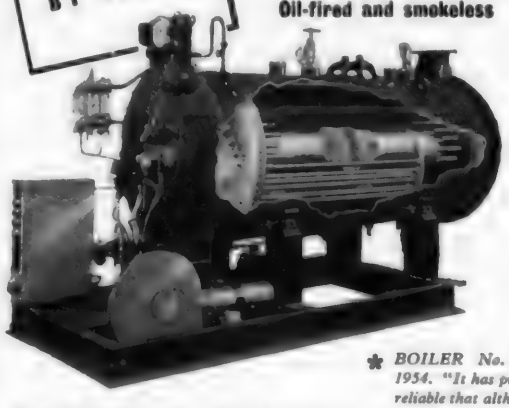

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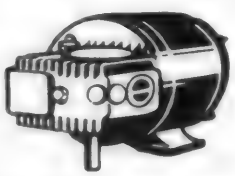

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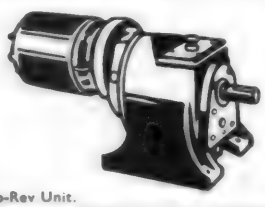

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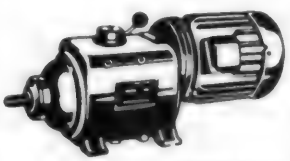

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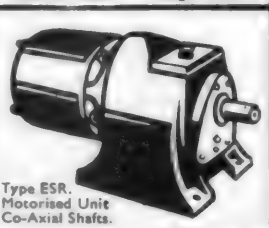

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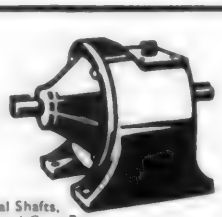

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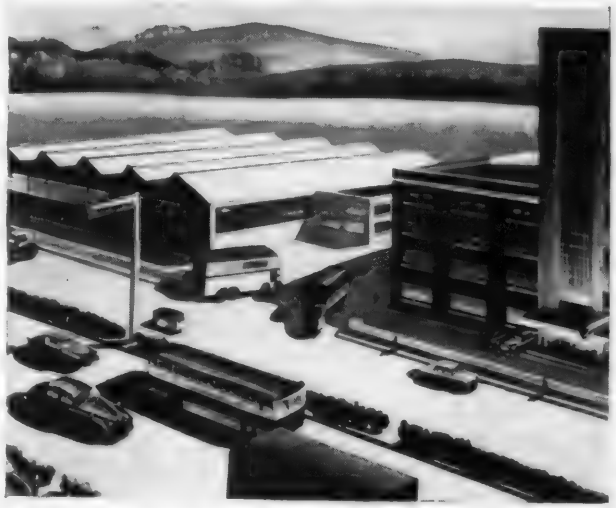

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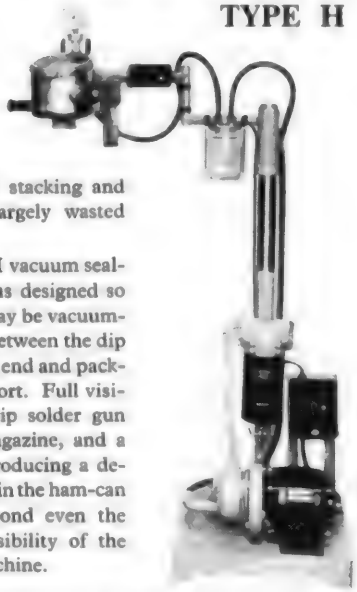

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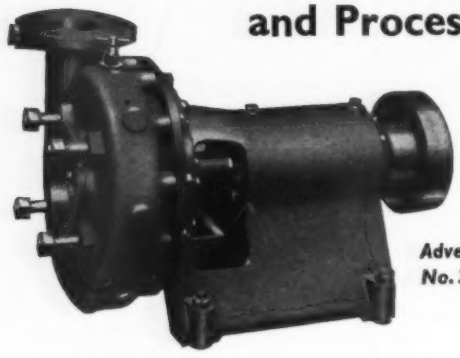

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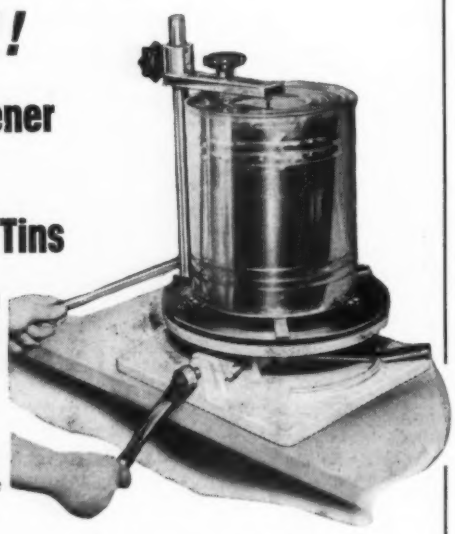

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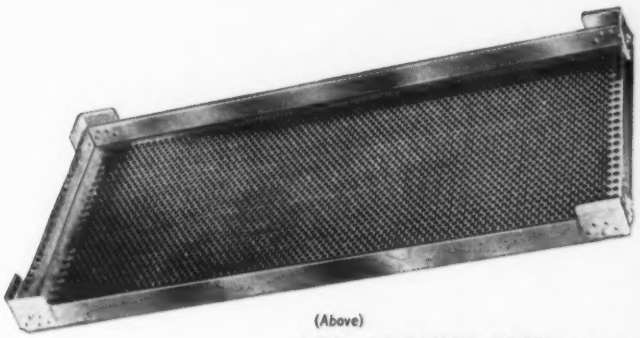

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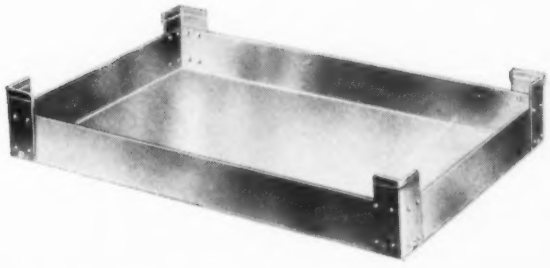

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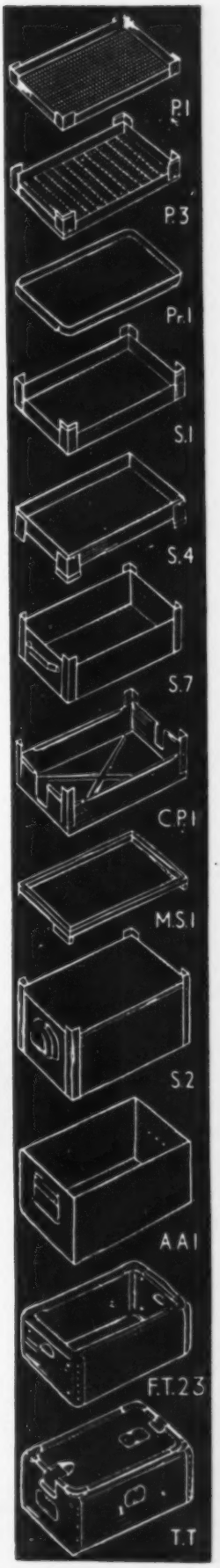

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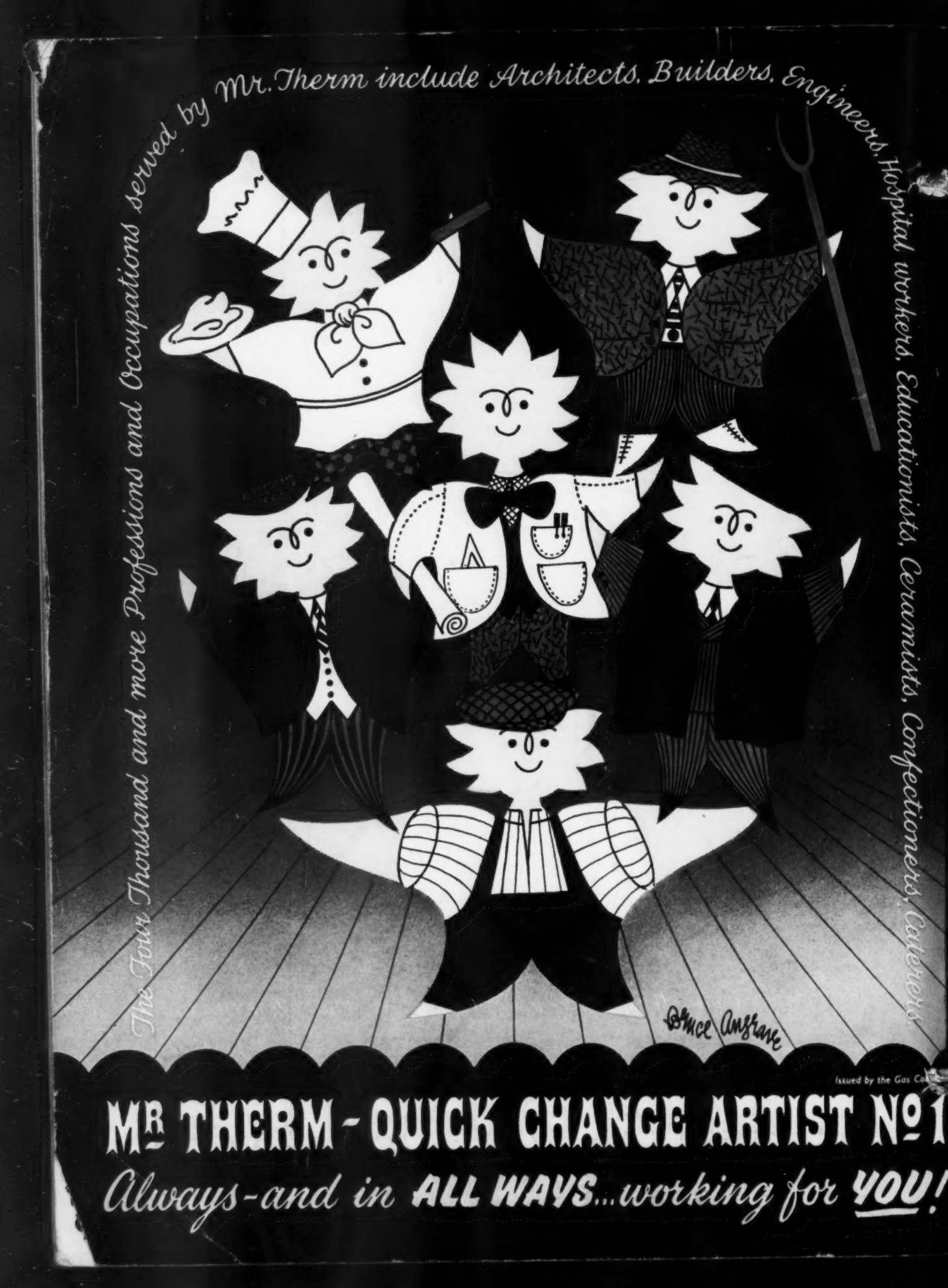
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